CONTENT

68010 Microprocessor Exceptions 4/25/89

e following error messages are used in Self-Test.
(Game Messages are documented separately.)

Some of the following Error Messages are caused by hardware problems. Others may result from software bugs that have heretofore escaped detection.

The English word of the error message is listed first, followed by the German translation in parenthesis.

BUS ERROR (BUS FEHLER)

A Bus error signal is produced by the hardware when a memory access is not completed in a reasonable amount of time.

At the start of each memory cycle, the Flip-Flop at 100K is set, enabling the counter at 160E. If the memory cycle is not terminated within 8 microseconds by a Data Acknowledge (DTACK), Valid Peripheral Address (VPA), or a RESET, the counter at 190E produces a Bus Error signal.

Most memory accesses run at maximum speed (500 ns) and are hardwired to produce DTACK. However, the GSP, the MSP, and the DUART can cause the 68010 to wait for them by delaying DTACK. A memory access to the DUART is guaranteed to cause a Bus Error when the DUART is not working or if it is missing.

example of a Bus Error is:

```
BUS ERROR       11111111        2222    R
                33333333        4444
```

'11111111' is the address being accessed when the Bus Error occurred.

'2222' is the data at address '11111111'.

'R' means it was reading address '11111111'.
('W' would mean it was Writing to address '11111111'.)

'33333333' is the address of the next instruction (or maybe the second instruction) to be fetched into the cache after the instruction which caused the Bus Error.

'4444' is the Data of address '33333333'

NMI

: is an unused hardware input that would cause a 68010 non-maskable interrupt it were used. If an NMI occurs it is probably a hardware problem associated with the 74LS148 Priority Interrupt Controller at 170H.

An example of an NMI Error is:

```
        NMI     11111111
```

'11111111' is the address of the next instruction (or maybe the second instruction) to be fetched into the cache after the instruction which caused the Error.

==========

ADDRESS ERROR (ADRESS-FEHLER)

An Address Error occurs when the processor attempts to access a word or a long word at an odd address. This is usually the result of a program error.

An example of a Address Error is:

```
ADDRESS ERROR   11111111        2222    R
                33333333        4444
```

111111' is the address being accessed when the Address Error occurred.

'2222' is the data at address '11111111'.

R means it was reading address '11111111'.
(W would mean it was Writing to address '11111111'.)

'33333333' is the address of the next instruction (or maybe the second instruction) to be fetched into the cache after the instruction which caused the Address Error.

'4444' is the Data of address '33333333'

==========

ILLEGAL INSTRUCTION (FALSCHE ANWEISUNG)

An Illegal Instruction Error occurs when the 68010 encounters the OP Code for an instruction that is not in the 68010 instruction set. This is usually the result of a program error.

An example of a Address Error is:

```
ILLEGAL INSTRUCTION     11111111
```

'11111111' is the address of the next instruction (or maybe the second truction) to be fetched into the cache after the instruction which caused Error.

==========

ZERO DIVIDE (0-TEILER)

A Zero Divide Error occurs when a Divide Instruction attempts to divide by Zero is is usually the result of a program error.

An example of a Zero Divide Error is:

ZERO DIVIDE 11111111

'11111111' is the address of the next instruction (or maybe the second instruction) to be fetched into the cache after the instruction which caused the Error.

CHK INSTRUCTION (CHK ANWEISUNG)

The Check (CHK) Instruction is a feature of the 68010 that is not used in this product. It would normally be used by the software to indicate a subscript is out of bounds. If one occurs it may mean that a Program ROM is bad.

An example of a CHK Instruction Error is:

CHK INSTRUCTION 11111111

'11111111' is the address of the next instruction (or maybe the second instruction) to be fetched into the cache after the instruction which caused the Error.

TRAPV INSTRUCTION (TRAPV ANWEISUNG)

The TRAPV Instruction is a feature of the 68010 that is not used in this product. It is normally used by the program to indicate an arithmetic overflow. If one occurs it may mean that a Program ROM is bad.

An example of a TRAPV Instruction Error is:

CHK INSTRUCTION 11111111

'11111111' is the address of the next instruction (or maybe the second instruction) to be fetched into the cache after the instruction which caused the Error.

PRIVILEGE VIOLATION

The PRIVILEGE VIOLATION Error is produced by a feature of the 68010 that is not used in this product. It is normally used by the program to indicate that a program running in User mode has attempted to execute an instruction available only to a program running in Supervisor mode. In this product all programs run in Supervisor mode. If one occurs it may mean that a Program ROM is bad.

An example of a PRIVILEGE VIOLATION Error is:

VILEGE VIOLATION 11111111

111111' is the address of the next instruction (or maybe the second instruction) to be fetched into the cache after the instruction which caused the Error.

TRACE (SPUR)

TRACE Error is produced by a feature of the 68010 that is not used in this product. If one occurs it may mean that a Program ROM is bad.

An example of a TRACE Error is:

TRACE 11111111

'11111111' is the address of the next instruction (or maybe the second instruction) to be fetched into the cache after the instruction which caused the Error.

FORMAT ERROR (FORMAT FEHLER)

The FORMAT Error is produced by a feature of the 68010 that is not used in this product. If one occurs it may mean that a Program ROM is bad.

An example of a FORMAT Error is:

FORMAT ERROR 11111111

'11111111' is the address of the next instruction (or maybe the second instruction) to be fetched into the cache after the instruction which caused the Error.

NITIALIZED INT VEC (FALSCH UNTERBRECHUNG)

The UNINITIALIZED INT VEC Error is produced by a feature of the 68010 that is not used in this product. If one occurs it may mean that a Program ROM is bad.

An example of an UNINITIALIZED INT VEC Error is:

UNINITIALIZED INT VEC 11111111

'11111111' is the address of the next instruction (or maybe the second instruction) to be fetched into the cache after the instruction which caused the Error.

SPURIOUS INTERRUPT (UNGEWOLLTE UNTERBRECHUNG)

The SPURIOUS INTERRUPT Error is produced by a feature of the 68010 that is not used in this product. If one occurs it may mean that a Program ROM is bad.

An example of a SPURIOUS INTERRUPT Error is:

SPUROUS INTERRUPT 11111111

'11111111' is the address of the next instruction (or maybe the second truction) to be fetched into the cache after the instruction which caused Error.

TRAP (FALLE)

A TRAP Error is produced by a feature of the 68010 that is sometimes used during development but which is not used on production versions of the product. If one occurs it may mean that a Program ROM is bad.

An example of a TRAP Error is:

```
TRAP    11111111
```

'11111111' is the address of the next instruction (or maybe the second instruction) to be fetched into the cache after the instruction which caused the Error.

ERROR MESSAGES FROM THE GAME PROGRAM

The following is a list of the various run time errors that can occur while the game program is running. These errors can occur during game play and attract mode, as well as in the operator screens, set controls, and disable broken controls items in the self test menu. Included is a description of what the error means and possible causes.

When one of these errors happens, the error message is displayed on the screen, and for some errors the place where the error occurred and the values in the processor registers are also displayed. This information is kept on the screen for 10 seconds or so, after which the watch dog is no longer accessed and the watch dog circuitry resets the game. If you want the game to hang up with the error message on the screen so you can copy the information down, disable the watchdog and the information will stay on the screen until the game is manually reset or powered off.

The number of each type of error that has happened since the error info was last cleared is stored in non-volatile RAM. You can read and clear this error table from the operator screens entry in the self-test menu. If you see a red message "BAD CHECKSUM, DATA MAY BE INVALID", the error table information was never cleared, or the game was powered off during the zero power memory test, or something is wrong with the zero power RAM. Any numbers you see in the table if this message is displayed are suspect, especially if they are very large. Try a zero power RAM test, then clear the errors and let the game run for a while and see what happens.

WATCH DOG RESET

You will never get a message about this error, but it is kept track of in the table in the operator screens.

The watch dog reset count keeps track of the number of times the game program crashed while running, for any reason. Any of the other errors in the table will add to the watch dog error count if the watch dog is enabled, so if you get 6 GSP timeout errors (for example) you should also get at least 6 in the watch dog error count.

Basically any hardware or software problem which happens while the game is running can cause entries in the watch dog error count. In addition, strong power line glitches, or someone resetting the game board while the game is running will also add to the count.

BUSS ERROR

This error means that the 68000 tried to access an address and didn't get the DTACK signal. Problems with the GSP, the MSP, the DUART, or the DTACK circutry could cause this.

ADDRESS ERROR

This means that the 68000 tried to do a word wide access to an odd address. It is most likely caused by a software bug. The old self test programs (before version 8.6) have a bug that generates an address error sometimes when you run the ADSP memory test and the memory is bad.

ILLEGAL INST ERROR

This means that the 68000 tried to run an instruction that does not exist. This is probably caused by EPROM problems; try checksumming the ROMS.

DIVIDE BY ZERO ERROR

The 68000 tried to divide something by zero. Could be a software bug or EPROM problem; try checksumming the EPROMS.

CHK INST ERROR
TRAP ERROR
PRIV VIOL ERROR

The 68000 tried to execute an instruction it shouldn't have. Could be a software bug or EPROM problem; try checksumming the EPROMS.

GSP HANDSHAKE ERROR

Something went wrong with communication between the 68000 and the GSP. Try running the GSP tests.

BAD POLY BUF ERROR

An invalid polygon buffer was received from the ADSP. Possible causes are bad object EPROMS on the ADSP board, hardware problems on the ADSP board, and software bugs. Try running the ADSP tests, especially the ADSP EPROM checksum tests.

MSP TIME OUT ERROR

This is caused by the MSP crashing. Try running the MSP tests.

ADSP TIME OUT ERROR

This is caused by the ADSP crashing. Possible causes are bad object EPROMS on the ADSP board, hardware problems on the ADSP board, and software bugs. Try running the ADSP tests, especially the ADSP EPROM checksum tests.

GSP TIME OUT ERROR

This is caused by the GSP crashing. Possible causes are hardware or software problems with the GSP, and hardware or software problems with the ADSP. Try running the GSP tests and the ADSP tests.

GENERIC ERROR
One of a number of software error checks in the game failed. Could be caused by EPROM problems, or possible software bugs. The message displayed on the screen when the generic error happens will give a clue to what is wrong.

NMI ERROR
A non-maskable interrupt was received by the 68000. This is almost certainly caused by problems with the interrupt circuitry on the 68000, since this interrupt is not used.

SPUR EXPTN ERROR
An unknown exception was received by the 68000. Check the EPROM checksums.

ILLEGAL ERROR CODE
There was an invalid code passed to the error function. Possible software bug, try checking the EPROM checksums.

```
/ROMEN: Program ROM {Read Only}
00 0000 - 01 FFFF       ROM 0          128K Bytes - SELF TEST (DOWNLOADER @ 10000)
   0000 - 03 FFFF       ROM 1          128K Bytes } PROGRAM - DRIVE
   0000 - 05 FFFF       ROM 2          128K Bytes }
06 0000 - 07 FFFF       ROM 3          128K Bytes PICS
08 0000 - 09 FFFF       ROM 4          128K Bytes
0A 0000 - 0B FFFF       ROM 5          128K Bytes UNIV
0C 0000 - 0D FFFF       ROM 6          128K Bytes LSP
0E 0000 - 0E 7FFF       ROM 7          128K Bytes through Slapstik
-----------------------------------
/NBUS  Naked Bus
   60 0000  {R/W}  SCOM IC

   60 4000  {R} Reset SCOM IC (Address Strobe)
   60 4000  {W} Latches on Address Strobe (Data is ignored)

        60 4000  LED 1 off
        60 4002  LED 2 off
        60 4004  LC1OFF          * Aux Control 1 Low      (Latched)
        60 4006  LC2OFF          * Aux Control 2 Low      (Latched)
        60 4008  ZP1WEN          * ZeroPower RAM Enable 1  (Latched)
        60 400A  ZP2WDIS         * ZeroPower RAM Disable 2 (Latched)
        60 400C  GSP Reset Low
        60 400E  MSP Reset Low

        60 4010  LED 1 on
        60 4012  LED 2 on
        60 4014  LC1ON           * Aux Control 1 High     (Latched)
        60 4016  LC2ON           * Aux Control 2 High     (Latched)
        60 4018  ZP1WDIS         * ZeroPower RAM Disable 1 (Latched)
        60 401A  ZP2WEN          * ZeroPower RAM Enable 2 (Latched)
        60 401C  GSP Reset High
        60 401E  MSP Reset High

   60 8000  {W}  Clear Watch Dog (Address Strobe)

   60 C000  {R}  SW1

        D15     Option Switch 7          ('0' = on)
        D14     Option Switch 6          ('0' = on)
        D13     Option Switch 5          ('0' = on)
        D12     Option Switch 4          ('0' = on)
        D11     Option Switch 3          ('0' = on)
        D10     Option Switch 2          ('0' = on)
        D9      Option Switch 1          ('0' = on)
        D8      Option Switch 0          ('0' = on)

        D7      Coin Switch 1                    ('0' = on)
        D6      Coin Switch 2                    ('0' = on)
        D5      Self-Test Switch                 ('0' = on)
        D4      8 Bit ADC, End of Conversion = '1'
        D3      12 Bit A/D, End of Conversion = '1'
        D2      Vertical Sync from GSP
        D1      Horizontal Sync from GSP
        D0      Diagnostic Switch                ('0' = on)

   60 C000  {W}  Clear Timer IRQ (Address Strobe)
```

/EXTBUS: Expansion Bus (2 MB)

80 0000 Driver ADSP

80 0000 - 80 7FFF {R/W} ADSP Program Memory 24K Bytes (32K space)
Word or Longword access only
PMD0 - PMD15 ==> 68010 D0 - D15 A1=1
PMD16 - PMD23 ==> 68010 D0 - D7 A1=0

80 8000 - 80 BFFF {R/W} ADSP Data Memory 16K Bytes
Word or Longword access only

81 0000 - 81 3FFF {R/W} Buffer Memory 16 K Bytes
Word or Longword access only

81 8000 {W} Latches on Address Strobe (Data is ignored)

81 8000	LED 1 on
81 8002	LED 2 on
81 8004	unused
81 8006	Buffer Control Low
81 8008	unused
81 800A	ADSP Bus Request Low
81 800C	ADSP Halt Low
81 800E	ADSP Reset Low
81 8010	LED 1 off
81 8012	LED 2 off
81 8014	unused
81 8016	Buffer Control High
81 8018	unused
81 801A	ADSP Bus Request High
81 801C	ADSP Halt High
81 801E	ADSP Reset High

81 8060 {W} Clear the Interrupt Generated by the ADSP.

83 8000 {R} Read Status D0 = /DIRQ, D1 = XFLAG

Note: The 68010 MUST set ADSP Bus Request Low before accessing ADSP Program Memory or ADSP Data Memory.

The ADSP internal address space is documented separately.

Main Board Memory Space for the Sound Board:

84 0000 W	MAINWR	Main writes to 'Main Latch', Sets 'Main Flag'
84 C000 W	SRES	Main resets Sound Processor
84 0000 R	MAINRD	Main reads 'Sound Latch', resets 'Sound Flag'
84 4000 R	MAINSTAT	Main reads Status: D15 = 'Main Flag' D14 = 'Sound Flag' D13 = '0' D12 = '1'

```
-------------------------------------
85 0000          Disk Interface

   0000 - 8D FFFF       ADSP II Graphics RAM (12)

8C 0000 - 8F FFFF       ADSP Graphics RAM Bd

90 0000 - 9F FFFF       RAM (1M)
-------------------------------------------------------------------------------
/LSBUS  LS Bus

A0 0000  {R}
A0 0000  {W}     /WR0, Write to Shifter Interface and Coin Counters
                 Latches on Address Strobe (Data is ignored)

         A0 0000
         A0 0002  SEL 1 Low
         A0 0004  SEL 2 Low
         A0 0006  SEL 3 Low
         A0 0008  SEL 4 Low
         A0 000A
         A0 000C  Coin Cointer 1 off
         A0 000E  Coin Counter 2 off

         A0 0010
         A0 0012  SEL 1 High
         A0 0014  SEL 2 High
         A0 0016  SEL 3 High
         A0 0018  SEL 4 High
         A0 001A
         A0 001C  Coin Counter 1 on
         A0 001E  Coin Cointer 2 on

A8 0000  {R}     /SW2, Sixteen External Switch Inputs D0 - D14
                         D15 = /SCBUSY
                         D14 = /OPTO CENTER FLAG

A8 0000  {W}     /WR1, Shifter Interface Latch, D8 - D15

B0 0000  {R}     /RD2, Read 8 Bit A/D
B0 0000  {W}     /WR2, Steering Wheel Latch, D8- D15

B8 0000  {R}     /RD3, Read 12 Bit A/D
B8 0000  {W}     /WR3, A/D Control

                         D8 - AD12BS     12 Bit A/D Byte Select
                         D7 - AD12CON    12 Bit A/D Write
                         D6 - AD12B      12 Bit A/D Address 1
                         D5 - AD12A      12 Bit A/D Address 0

                         D3 - ALE, SC    8 Bit A/D Write
                         D2 - ADDC       8 Bit A/D Address C
                         D1 - ADDB       8 Bit A/D Address B
                         D0 - ADDA       8 Bit A/D Address A
```

/HSBUS: Hot Stuff Bus {R/W}

```
 0000          GSP     Graphics System Processor

:0 0000        GSP HSTADRH
C0 0002        GSP HSTADRH

C0 0004        GSP HSTADRL
C0 0006        GSP HSTADRL

C0 0008        GSP HSTCTL
C0 000A        GSP HSTCTL

C0 000C        GSP HSTDATA
C0 000E        GSP HSTDATA
```

The Host Addresses are double mapped to permit Long Word Data Writes in Host auto-increment mode.

The GSP internal memory is documented separately.

```
C0 4000          MSP     Model System Processor

 C0 4000         MSP HSTADRH
 C0 4002         MSP HSTADRH

 C0 4004         MSP HSTADRL
 :0 4006         MSP HSTADRL

 C0 4008         MSP HSTCTL
 C0 400A         MSP HSTCTL

 C0 400C         MSP HSTDATA
 C0 400E         MSP HSTDATA
```

The Host Addresses are double mapped to permit Long Word Data Writes in Host auto-increment mode.

The MSP internal memory is documented separately.

==========

/RAMEN: Ram and DUART {R/W}

```
FF 0000                  DUART
FF 4000 - FF 4FFE        ZRAM  (4K Bytes, only 2K even bytes loaded)
FF 8000 - FF BFFF        RAM 0 (16K Bytes)
FF C000 - FF FFFF        RAM 1 (16K Bytes)
```

The ZRAM Clock/Calender Locations are documented separately.

==========

Interrupts:

Priority	Source	68010 Interrupt Level
1	DUART IRQ	6
2	Timer (4 ms)	5
3	LINK IRQ	4
4	GSP IRQ	3
5	ADSP IRQ	2
6	MSP IRQ	1

Bus Errors: If DTACK is not generated as required, BERR will be asserted.

Differences between MultiSync and Turbo J. Margolin 12/12/88

e Turbo has 1 MB of VRAM and fills at a maximum rate of 48 MPixels/sec; the MultiSync has 512KB VRAM and fills at a maximum rate of 24 MPixels/sec.

In POLY Mode, each word writes only 8 pixels. They are:

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
	P		P		P		P		P		P		P		P

The Scroll register scroll moves it a maximum of 8 pixels. Changing the HSync Register moves it either 4 or 8 pixels depending on the sync configuration.

In order to accomodate the SCOM IC, the SW1 Address has been moved to 60 C000. (see COMN.ASM)

SCOM is at 60 0000 (R/W).
/SCBUSY is at D15 on SW2 (A8 0000).
SCOM is reset by address SCRES (60 4000) as well as by System Reset.

MultiSync Display Modes

BCLK, VCLK, and SPEED are the jumper plugs by which the different sync modes are selected. The GSP Sync Registers must also be programmed appropriately.

		BCLK	VCLK	SPEED	XOSC4
Medium Speed:	512 x 384	16MZ	4MHZ	none	not used
Standard Speed:	320 x 240	QB (6.6)	QB (6.6)	A,C	40 MHz
	640 x 240	QB (13.3)	QB/2 (6.6)	B	"
	512 x 240	QB (10)	QB/2 (5)	A,B	"
Fast Standard (16.5 KHz Horiz., 53.6 Hz Vert.)	512 x 288	QB	QB/2	B	32 MHz

The Multisync/Driver Sound Interface is a 16 bit parallel interface with full handshaking.

The 68010 on the Multisync Board writes to a 16 bit latch (MAINWR). This Write also sets a flag (MAINFLAG) that can be read by both the 68010 on the MultiSync board and by the 68000 on the Driver Sound Board.

When the 68000 on the Sound Board reads the latch (SOUNDRD), MAINFLAG is cleared. This is how the 68010 knows that the data has been read by the Sound Board.

When MAINFLAG is set by the MultiSync 68010 an interrupt is generated for the Sound 68000.

The Sound 68000 can also write to a latch (SOUNDWR) that sets a flag (SOUNDFLAG) that both processors can read.

When the MultiSync 68010 reads this latch (MAINRD), SOUNDFLAG is cleared. This is how the Sound 68000 knows that the data has been read by the MultiSync Board. SOUNDFLAG does not generate an interrupt for the MultiSync 68010.

MultiSync Addresses:

```
MAINWR          EQU     $840000         * Main Writes to Sound Board
MAINRD          EQU     $840000         * Main reads from Sound Board
MAINSTAT        EQU     $844000         * Main/Sound Status
                                                d15 = MAINFLAG
                                                d14 = SOUNDFLAG
SRES            EQU     $84C000         * Reset Sound Board
```

SRES is an address strobe (no data required) that resets the Sound Board. It triggers a one-shot that produces a reset pulse of several hundred microseconds.

As implemented, command codes $55XX have been reserved for Self-Test functions. In particular, $55A1 was assigned to the PLAY Sounds function.

The following code was used to implement this function. Note:

1. The subroutine to implement the interface protocol begins with a Reset and does extensive error checking and reporting. For example, the Sound Board echoes the data it receives. This was because it was part of Self-Test.

2. In the Game, the Sound Board was not reset for each command and there was little error checking. The MultiSync 68010 mostly just wrote to MAINWR.

3. The variable 'testype' is used by Rick's program to call either the Play Sounds routines or the Shifter Test screen.

4. The command code $55A1 is stripped by the Sound Board Operating System and is not passed to the Play Sounds Code on the Sound Board.

5. At the conclusion of Play Sounds, Rick's code executes an RTS. This causes the program to return to the code that called SB1.

```
        XREF    testtype
* 55A1  'RETURN SOUND NUMBERS'
  1:    MOVE.W  #$55A1,D0
        BSR     SNDSEND

        MOVE.W  #0,testtype             * Play Sounds
        JMP     ricksoundtest
*---------
        XDEF    SNDSEND
SNDSEND
        MOVE.W  #$2F00,SR       * Disable Interrupts
        CLR.W   SRES            * Sound Reset
        MOVE.W  D0,MAINWR
        MOVE.W  D0,TEMP1        * Save it
        MOVE.W  #$2400,SR       * Enable Interrupts

* Sound Reset Timeout is 500 MS = 500/16 = 31 VSYNC
        MOVE.W  #31,D7
SNDSD1  JSR     WAITSYNC
        BTST    #6,MAINSTAT     * Check for Sound Flag
        BNE     SNDSD3          * Got it
        SUB.W   #1,D7
        BNE     SNDSD1          * Try again

* Timeout Error          Message 'Sound Board Timeout Error'
SNDSD2  MOVE.W  #SNDMSG+21,D0
        JSR     DOMSGW

        BSR     WAIT3SEC        * Wait 3 seconds

        CLR.W   D0              * Clear the Screen
        JSR     FILL
        ADD.L   #4,A7           * Return to Sound Menu (one JSR back)
        RTS

* Sound Board has read the data
SNDSD3  MOVE.W  MAINRD,D0
        CMP.W   TEMP1,D0        * Is it what we sent?
        BEQ     SNDSD4

* Data Error              Message 'Interface Data Error'
        MOVE.W  #SNDMSG+22,D0
        JSR     DOMSGW

        BSR     WAIT3SEC        * Wait 3 seconds

        CLR.W   D0              * Clear the screen
        JSR     FILL
        ADD.L   #4,A7           * Return to Sound Menu (one JSR back)
SNDSD4  RTS
*-------------------------------------------------------------------------
        XDEF    WAIT3SEC
WAIT3SEC
        MOVE.W  #179,D0
  3LP   JSR     WAITSYNC        * Wait for Vertical Sync
        DBF     D0,WT3LP
        RTS
*=========================================================================
```

How to Implement it on the DS II

The DS II Board does not have a Parallel Interface with Handshaking.

Instead, the MultiSync 68010 asserts the 2101 Bus Request Line, which stalls the 2101 and tristates its external memory buses and allows the 68010 direct access to the 2101's external program and external data memory. (The 68010 cannot access the 2101's internal memory.)

Assign the following variables to the 68010's data memory:

```
MAINWR          $808000     *   2101 Data Memory
MAINFLAG        $808002     *   2101 Data Memory
MAINRD          $808004     *   2101 Data Memory
SOUNDFLAG       $808006     *   2101 Data Memory

DS2_BR_L        $81400A     * Latched address strobe
DS2_BR_H        $81401A     * Latched address strobe

DS2_RES_L       $81400E     * Latched address strobe
DS2_RES_H       $81401E     * Latched address strobe

DS2_IRQ2_L      $814006     * Latched address strobe
DS2_IRQ2_H      $814016     * Latched address strobe

DS2_LED_ON      $814000     * Test LED On
DS2_LED_OFF     $814000     * Test LED Off

DS2_2101_ACC    $814004     * Latched Address strobe, normal mode
DS2_68K_ACC     $814014     * Latched Address strobe, self-test only

DS2_RSTAT       $810000     * Read IRQ Status: d0 = 0 is /ADSPIRQ

DS2_CGI         $812000     * Clear ADSP Interrupt
```

Assign the following variables to the 2101's data memory:

```
              2101 address space
SOUNDRD           H#0000
MAINFLAG          H#0001
SOUNDWR           H#0002
SOUNDFLAG         H#0003
```

What the 68010 writes as MAINWR, the 2101 will read as SOUNDRD.
What the 2101 writes as SOUNDWR, the 68010 will read as MAINRD.

Both 68010 and 2101 will read and write MAINFLAG and SOUNDFLAG as required.

The 68010 will be able to generate an interrupt for the 2101.

```
CLR.W   DS2_IRQ2_L
CLR.W   DS2_IRQ2_H
```

The 2101 must configure IRQ2 as edge sensitive; otherwise it might get finished before the 680120 can pull it high again.

```
* 68010 writes to the interface from D0:
WR68K:  CLR.W   DS2_BR_L                * Get the Bus

        MOVE.W  D0,MAINWR               * Write the data

        MOVE.W  #$0FFFF,MAINFLAG        * Set MAINFLAG

        CLR.W   DS2_BR_H                * Release the Bus

        CLR.W   DS2_IRQ2_L              * Generate a 2101 Interrupt
        CLR.W   DS2_IRQ2_H

        RTS

* To check if the 2101 has taken the data:
* Returns with D0 = MAINFLAG
CHKMFLAG:
        CLR.W   DS2_BR_L                * Get the bus

        MOVE.W  MAINFLAG,D0             *

        CLR.W   DS2_BR_H                * Release the Bus

        RTS
```

The 68010 should not do this in a tight loop since it does stall the 2101.

Summary:

68010 writes:
The 68010 takes the 2101 bus;
Writes data to MAINWR;
Sets MAINFLAG to $0FFFF;
Releases the 2101 Bus;
Generates a 2101 interrupt.

68010 reads:
The 68010 takes the 2101 bus;
Reads SOUNDFLAG to see if there is data waiting;
If there is:
Read MAINRD;
Clear SOUNDFLAG.
Releases the 2101 Bus.

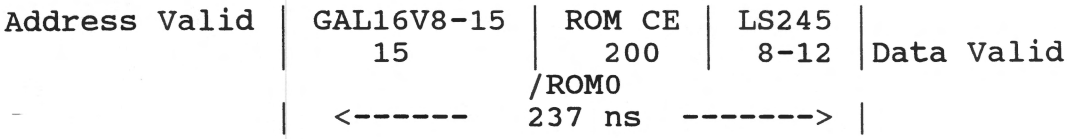
2101 Reads (after getting IRQ2):
Reads MAINFLAG to see if there is data waiting (H#FFFF);
If there is:
Read SOUNDRD;
Clear MAINFLAG.
(RTI).

2101 Writes:
Write data to SOUNDWR;
Set SOUNDFLAG to H#FFFF;

en SOUNDFLAG is H#0000 the 68010 has read the data.
(The 2101 should check SOUNDFLAG before writing new data.)

Timing for MultiSync II ROMs

M0 - ROM6 without /AS:



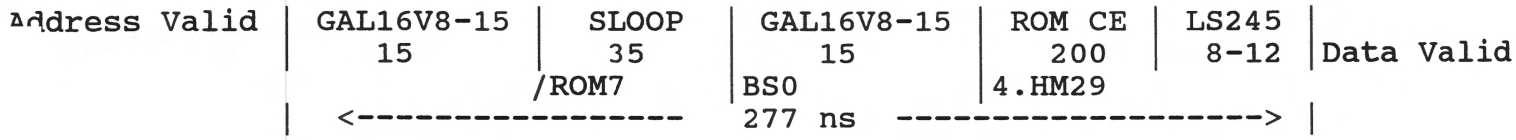
Clock Low to Address Valid = 62
Data Setup to Clock Low = 10
Data Required = 6 * 62.5 - 62 - 10 = 375 - 62 - 10 = 303 ns

Addresses must go through LS244 Buffer 12-18, therefore will be slower than GAL16V8-15 by 3 ns.

ROM0 - ROM6 with /AS:

Clock High to /AS = 60
Data Setup to Clock Low = 10
5 * 62.5 - 60 - 10 = 312.5 - 60 - 10 = 242.5

ROM7 must not use /AS



Address Valid to Data Required = 303 ns

MultiSync Turbo - Display Formats

.e MultiSync Turbo supports the following Non-Interlaced formats:

Speed	Screen	VRAM	2 Buffers	Memory for Program and Data
Medium	512x384x8	512KB	384KB	128KB
Standard	320x240x8	512KB	150KB	362KB
Standard	512x240x8	512KB	240KB	272KB
Standard	640x240x8	512KB	300KB	212KB

Note that 512x240 does not have square pixels.

The system will support interlaced scanning assuming the monitors can interlace properly.

Speed	Screen	VRAM	Buffers	Memory for Program and Data
Standard	512x480x8	512KB	480KB (2 Buffers)	32KB
			240KB (1 Buffer)	272KB
Standard	640x480x8	512KB	300KB (1 Buffer)	212KB

Note that 512x480 does not have square pixels.

MultiSync Turbo - Specifications

Main Board:

- 68010 at 8 MHz
- 1MB ROM (16 x 27512)
- 32KB RAM
- 4KB Zeropower RAM (Internal Battery; Timekeeper plus ZeroPower)
- DUART with RS-232
- 8 Bit A/D
- 12 Bit A/D
- 16 Switch Inputs
- Steering Wheel and Shifter Interfaces
- Expansion Interface
- SCUM IC

GSP Turbo:

- 34010
- 512KB VRAM
- 8 Bits/Pixel
- 24M Pixels/sec Fill
- 6 M Pixels/sec PixBlt

MSP:

- 34010 (Runs model math in C)
- 128KB DRAM

==========

ADSP Board:

- ADSP-2100 DSP
- 8Kx16 Data RAM
- 8Kx24 Program RAM
- 256KB Graphics Data ROM
- 2x16KB Output RAM

==========

Sound Board:

- 68000 at 8 MHz
- 64K/128K Bytes Program ROM (2 x 27256/27512)
- 16KB Program RAM
- 5220C Speech Synthesizer

- 32010 DSP
- 4KB RAM
- 768KB Sound Data ROM (12 x 27512)
- 12 Bit DAC Output
- Filter
- 512 Byte Communications RAM

- Microphone Input, Preamp, and Filter

```
* COMMON VARIABLES FOR GSPTST
* Hardware Addresses, RAM variables, and constants
* HARDWARE: MultiSync Main Rev 1, 2
   ================================================================================

* MACROS (These are necessary in order to use Absolute Short addressing.)

DSB:    MACRO                   * Assign Byte(s), using Equates.
\1      EQU     CURR
CURR    SET     CURR+\2
        ENDM

DSW:    MACRO                   * Assign Word(s), using Equates.
\1      EQU     CURR
CURR    SET     CURR+\2*2
        ENDM

DSL:    MACRO                   * Assign Long Word(s), using Equates.
\1      EQU     CURR
CURR    SET     CURR+\2*4
        ENDM

ALIGN:  MACRO                   * Align to an even byte address
        IFNE    CURR/2*2-CURR
CURR    SET     CURR+1
        ENDC
        ENDM

   ================================================================================
   ================================================================================
   rdware Addresses:

ROM     EQU     $0              * 1M Bytes in sixteen 27512s
*---------------------
* OPTO base is $400000
OPTORD  EQU     $400000
OPTORES EQU     $404000
CENRES  EQU     $408000
*---------------------
SCOM    EQU     $600000         * SCOM
SCRES   EQU     $604000         * Reset SCOM IC (Address Strobe) READ ONLY
*---------------------
LED1OFF EQU     $604000         * (W) LED 1 Off          (Latched)
LED2OFF EQU     $604002         * (W) LED 2 Off          (Latched)
LC1OFF  EQU     $604004         * Aux Control 1 Low      (Latched)
LC2OFF  EQU     $604006         * Aux Control 2 Low      (Latched)
ZP1WEN  EQU     $604008         * ZeroPower RAM Enable 1  (Latched)
ZP2WDIS EQU     $60400A         * ZeroPower RAM Disable 1 (Latched)
GRESL   EQU     $60400C         * (W) GSP Reset Low              (Latched)
MRESL   EQU     $60400E         * (W) MSP Reset Low              (Latched)

LED1ON  EQU     $604010         * (W) LED 1 On           (Latched)
LED2ON  EQU     $604012         * (W) LED 2 On           (Latched)
LC1ON   EQU     $604014         * Aux Control 1 High     (Latched)
    )N  EQU     $604016         * Aux Control 2 High     (Latched)
    /DIS EQU    $604018         * ZeroPower RAM Disable 1 (Latched)
ZP2WEN  EQU     $60401A         * ZeroPower RAM Enable 1 (Latched)
GRESH   EQU     $60401C         * (W) GSP Reset High     (Latched)
MRESH   EQU     $60401E         * (W) MSP Reset High     (Latched)
```

```
*--------------------
WDCLR    EQU     $608000          * (W) Clear Watch Dog

TROCLR   EQU     $60C000          * (W) Clear Timer IRQ
         EQU     $60C000          * (R) Switch Inputs
         EQU     $60C000          * (R) Option Switch = SW1.B
*--------------------
ADSP             EQU     $800000          * ADSP Board

* Program 80 0000        80 0000 - 80 3FFF is D0-D15, 80 4000 - 80 7FFF is D0-D7
* Data    80 8000
* STAT   81 0000
* CGINT   81 2000
* LATCHES 81 4000        Works on both Reads and Writes

ADSP_STAT        EQU     $810000          * Read ADSP Status
ADSP_CLI         EQU     $812000          * Clear the ADSP Interrupt
*-----
* Latched Bits Work on both Reads and Writes, so let's be careful out there
ADSP_LED1_ON     EQU     $814000          * ADSP LED 1 on
ADSP_2101_ACC    EQU     $814004          * 2101 controls DS II Peripherals
ADSP_BUFF_L      EQU     $814008          * ADSP Buffer Control Low
ADSP_BR_L        EQU     $81400A          * ADSP Bus Request Low
ADSP_RES_L       EQU     $81400E          * ADSP Reset Low

ADSP_LED1_OFF    EQU     $814010          * LED 1 off
ADSP_68K_ACC     EQU     $814014          * 68010 controls DS II Peripherals
ADSP_BUFF_H      EQU     $814018          * ADSP Buffer Control High
ADSP_BR_H        EQU     $81401A          * ADSP Bus Request High
   P_RES_H       EQU     $81401E          * ADSP Reset High
   ---
   rites
ADSP_DACL        EQU     $80C000          * DAC Left
ADSP_DACR        EQU     $80C002          * DAC Right
ADSP_ROMADRL     EQU     $80C004          * ROM Address Low (RA0 - RA15)
ADSP_ROMADRH     EQU     $80C006          * ROM Address High (RA16-RA18)
ADSP_GINT        EQU     $80C008          * Generate a 68010 Interrupt
*-----
* Read
ADSP_GROM        EQU     $80C000          * Graphics ROM
*-----
* Not used by DS II
ADSP_LED2_ON     EQU     $814000          * ADSP LED 2 on
ADSP_LED2_OFF    EQU     $814012          * LED 2 off
ADSP_HALT_L      EQU     $814002          * ADSP Halt Low
ADSP_HALT_H      EQU     $814012          * ADSP Halt High
ADSP_BCON_L      EQU     $814002          * ADSP Buffer Control Low
ADSP_BCON_H      EQU     $814012          * Buffer Control High
*--------------------
MAINWR           EQU     $840000          * Main Writes to Sound Board
MAINRD           EQU     $840000          * Main reads from Sound Board
MAINSTAT         EQU     $844000          * Main/Sound Status
SRES             EQU     $84C000          * Reset Sound Board
*--------------------
DSKPEN           EQU     $85C000
   LATCH         EQU     $85C800

XRAM32           EQU     $900000          * 64K   90 0000 - 90 FFFF 32K*8s
XRAM8            EQU     $904000          * 64K   90 4000 - 90 FFFF  8K*8s
XZRAM            EQU     $910000          * 16K   91 0000 - 91 3FFF
```

```
XROM0           EQU     $920000         * 64K   92 0000 - 92 FFFF
XROM1           EQU     $940000         * 256K  94 0000 - 97 FFFF

PLD65RD0        EQU     $914000         * 16KB    91 4000 - 91 7FFF
    65WR        EQU     $914000         * 16KB    91 4000 - 91 7FFF
    65RD1       EQU     $918000         * 16KB    91 8000 - 91 BFFF

* XTRA1  EQU    930000  64KB            93 0000 - 93 FFFF
*---------------------
SEL1L   EQU     $0A00002        * Shifter Control Select 1 Low
SEL2L   EQU     $0A00004        * Shifter Control Select 2 Low
SEL3L   EQU     $0A00006        * Shifter Control Select 3 Low
SEL4L   EQU     $0A00008        * Shifter Control Select 4 Low
CC1OFF  EQU     $0A0000C        * Coin Counter 1 Off
CC2OFF  EQU     $0A0000E        * Coin Counter 2 Off

SEL1H   EQU     $0A00012        * Shifter Control Select 1 High
SEL2H   EQU     $0A00014        * Shifter Control Select 2 High
SEL3H   EQU     $0A00016        * Shifter Control Select 3 High
SEL4H   EQU     $0A00018        * Shifter Control Select 4 High
CC1ON   EQU     $0A0001C        * Coin Counter 1 On
CC2ON   EQU     $0A0001E        * Coin Counter 2 On
*---------------------
SHLATCH EQU     $0A80000        * W, Shifter Interface Latch, D8 - D15
SW2     EQU     $0A80000        * R, Switch Inputs

SWLATCH EQU     $0B00000        * W, Steering Wheel Latch, D8 - D15
ADC8    EQU     $0B00000        * R, 8 Bit A/D Output

ADCON   EQU     $0B80000        * W, A/D Control
    12  EQU     $0B80000        * R, 12 Bit A/D Output
    --------------------
GSPADRH EQU     $0C00000        * TMS-34010 GSP Host Address High
GSPADR  EQU     $0C00002        * TMS-34010 GSP Host Address (Long Word Address)
GSPADRL EQU     $0C00004        * TMS-34010 GSP Host Address Low
GSPCTL  EQU     $0C00008        * TMS-34010 GSP Control
GSPDATA EQU     $0C0000C        * TMS-34010 GSP Host Data

MSPADRH EQU     $0C04000        * TMS-34010 MSP Host Address High
MSPADR  EQU     $0C04002        * TMS-34010 MSP Host Address (Long Word Address)
MSPADRL EQU     $0C04004        * TMS-34010 MSP Host Address Low
MSPCTL  EQU     $0C04008        * TMS-34010 MSP Control
MSPDATA EQU     $0C0400C        * TMS-34010 MSP Host Data
*---------------------
DUART   EQU     $0FFFF0000      * Duart is high byte data only

ZRAM    EQU     $0FFFF4000      * 2k x 8 Timekeeper, Even bytes only

RAM     EQU     $0FFFF8000      * 32k Bytes in four 8k x 8 SRAMs
*---------------------
USTACK  EQU     RAM+$4000       * User Stack
*=============================================================================
DSK_PAR         EQU     DSKPEN+0
DSK_PDR         EQU     DSKPEN+4
DSK_EMR         EQU     DSKPEN+8
    _ESR        EQU     DSKPEN+12
    _PCR        EQU     DSKPEN+14
DSK_PIR         EQU     DSKPEN+16
DSK_PCRH        EQU     DSKPEN+20
DSK_PARE        EQU     DSKPEN+22
```

```
DSK_PDR2        EQU     DSKPEN+24

DSK_RES_L       EQU     DSKLATCH+$00
DSK_ZNRES_L     EQU     DSKLATCH+$02
    ZWDIS1      EQU     DSKLATCH+$04
    ZWEN2       EQU     DSKLATCH+$06
DSK_320_RL      EQU     DSKLATCH+$08
DSK_LED_ON      EQU     DSKLATCH+$0E

DSK_RES_H       EQU     DSKLATCH+$10
DSK_ZNRES_H     EQU     DSKLATCH+$12
DSK_ZWEN1       EQU     DSKLATCH+$14
DSK_ZWDIS2      EQU     DSKLATCH+$16
DSK_320_RH      EQU     DSKLATCH+$18
DSK_LED_OFF     EQU     DSKLATCH+$1E
*=============================================================================
DS3_PMEMH       EQU     $800000         * Graphics Program Memory,
*                                         D0 - D15 = GD8 - GD15
*                                         $80 0000 - $80 3FFF

DS3_PMEML       EQU     $804000         * Graphics Program Memory,
*                                         D0 - D7 = GD0 - GD7
*                                         $80 4000 - $80 7FFF

DS3_DMEM        EQU     $808000         * Graphics Data Memory
*                                         $80 8000 - $80 BFFF

S68WR           EQU     $822000         * Sound Port Write Data
S68RD0          EQU     $822000         * Sound Port Read Data
    RD1         EQU     $822800         * Sound Port Read Status
    :           EQU     $823000         * Clear Sound Interrupt (/LIRQ)

DS3LATCH        EQU     $823800         * Latched Addresses
SND_RES_L       EQU     $823800         * Sound Processor
X_RES_L         EQU     $823802         * X Processor
GR_BR_L         EQU     $823804         * Graphics Processor Bus Request
GR_RES_L        EQU     $823806         * Graphics Processor Reset
GR_ACC_OFF      EQU     $823808         * Graphics 68010 Access disabled
DS3LED_ON       EQU     $82380E         * DS III LED on

SND_RES_H       EQU     $823810         * Sound Processor
X_RES_H         EQU     $823812         * X Processor
GR_BR_H         EQU     $823814         * Graphics Processor Bus Request
GR_RES_H        EQU     $823816         * Graphics Processor
GR_ACC_ON       EQU     $823818         * Graphics 68010 Access enabled
DS3LED_OFF      EQU     $82381E         * DS III LED off

G68WR           EQU     $820000         * Graphics Port Write Data
G68RD0          EQU     $820000         * Graphics Port Read Data
G68RD1          EQU     $820800         * Graphics Port Read Status
GCGI            EQU     $821000         * Clear Graphics Interrupt (/ADSPIRQ)
*=============================================================================
* RAM variables will be addressed in Absolute Short mode. (ZRAM is out of range)
*
* In order for the assembler to recognize Absolute Short Negative, the address
    must be sign extended to 32 bits. Example: FFFFC000 instead of 00FFC000
    R   SET     RAM             * RAM Hardware Address

* Put variables here with DSB, DSW, and DSL macros
```

```
        DSB     DYR,1                   * Clock Display
        DSB     DMON,1
        DSB     DDATE,1
        DSB     DDAY,1
        DSB     DHOUR,1
        DSB     DMIN,1
        DSB     DSEC,1

        DSB     AD8VAL,8
        DSB     COUNTER,1

        ALIGN

        DSW     AD12VAL,4
        DSW     F_RED,1
        DSW     F_GREEN,1
        DSW     F_BLUE,1
*=======================================================================
        DSW     MENUSEL,1               * Main Menu Select
        DSW     SFMENUSEL,1             * Special Functions Menu Select
        DSW     MTPSEL,1                * Menu Select for Monitor Test Patterns
        DSW     CMENSEL,1
        DSW     SUB1MENU_SEL,1          * Sub 1 Menu Select
        DSW     SUB2MENU_SEL,1          * Sub 2 Menu Select
        DSW     MENU_BASE,1
        DSW     MENU_LAST,1
        DSW     MENU_INDEX,1

        DSW     SW_0,8
        DSW     SW_1,8
        DSW     SW_2,8
        DSW     SW_3,8
        DSW     LTSW,8
        DSW     RTSW,8

        DSW     TEMP1,1
        DSW     TEMP2,1
        DSW     TEMP3,1
        DSW     TEMP4,1

        DSW     STROM,24        * Self-Test ROM Results
        DSW     STRAM,8         * Self-Test RAM Results

        DSL     LOOP,1
        DSL     TBLADR,1

        DSW     VALUE,1
        DSW     ERRCOUNT,1

        DSW     TBLEND,1
        DSW     MSPFLAG,1

        DSL     BERRLOG,1

        DSW     LINE_HI,1       * used for measuring line voltage
        DSW     LINE_LO,1       *
        DSW     LINE_AVG,1      * Line Average (DC) Level
        DSW     LINE_RMS,1      * RMS Line Voltage
        DSL     LINE_MS,1       * Line Mean Squared Level
```

```
DSW     STW_TIME,1          * Steering Wheel Time
DSW     STW_AMPL,1          * Steering Wheel Amplitude
DSW     STW_FORCE,1         * Steering Wheel Force
DSW     FBFLAG,1            * Feedback (routine) Flag
DSW     OPTO_FLAG,1
DSW     BCDVAR,1
DSW     BCDVAR2,1
DSW     SIGN,1
DSW     STBL,1                      * Sine Table address
DSW     COUNTDIR,1

DSW     STWMIN,1            * Steering Wheel Minimum
DSW     STWMAX,1            * Steering Wheel Maximum
DSW     STWCEN,1            * Steering Wheel Center
DSW     STWPOS,1            * Desired Steering Wheel Position
DSW     STWCYC1,1           * Cycles MSD
DSW     STWCYC2,1           * Cycles
DSW     STWCYC3,1           * Cycles LSD

DSW     LFSREG,1            * Linear Feedback Shift Register

DSL     ADRPTR,1
DSW     RCOUNTER,1
DSW     YADR,1
DSW     SCRVAL,1
DSW     SCRSGN,1

DSW     POS_LIMIT,1
DSW     NEG_LIMIT,1

DSW     SOUNDREV,1

DSW     OPTO_PSN,1
DSW     OPTO_PSN2,1
DSW     OPTO_LAST,1
DSW     OPTOCEN,1
DSW     OPCENCNT,1

DSW     DCOUNT,1

DSW     BCONMSG,1
DSL     ASFB_MENSEL,1
DSL     BCON_A,1
DSL     BCON_B,1
DSW     SOMDATA,1
```

Title / ASSY, SUB, MULTISYNC PCB	P/L A044998-01	Rev / F
GAMES ENGINEERING PARTS LIST SPECIFICATION	PROJECT:	

ATARI GAMES

Drawn by: STAFF Checked by: AJ	Next Assy: A046901-01
Design Eng: JM Proj. Eng: RM	Comp. Eng: Mfg. Eng: DW
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE						
B	ECN 13481						
C	ECN 13482						
D	ECN 13517						
E	ECN 13817						
F	ECN 14093	5-17-90	JM				

ITEM	PART NO	QTY	Description	Ref. Designators
1	044999-01	1	P.C. Board	
2				
3				
4				
5	122015-102	24	CAP, .001µF, 50V, 10%	C44-63,C228,C359,C360, C378
6				
7	122002-103	1	CAP, .01µF, 50V, CER	C2
8	122002-104	258	CAP, .1µF, 50V, CER	C3-14,C16,C19-21, C24-43,C65-78,C80-82, C85-87,C94-106, C114-117,C123,C124, C129-137,C140,C141, C143,C144,C146-189, C193-202,C204-227, C230-238,C243-249, C251-259,C264-273, C275-293,C298,C299, C306-309,C315-320, C330-333,C341,342, C349-352,C354,C355, C358,C364,C365,C367, C369-377,C379
9	122015-224	1	CAP, .22µF, 50V, CER	C142
10	122016-102	5	CAP, 1000PF, 100V, CER	C138,C139,C361-363
11	122016-101	4	CAP, 100PF, 100V, CER	C83,C84,C335,C336,
12	124000-107	1	CAP, 100µF, 35V, ELEC	C1
13	122016-100	5	CAP, 10PF, 100V, CER	C79,C323-326
14	127001-106	1	CAP, 10µF, 20V, TANT	C368
15	124000-106	5	CAP, 10µF, 35V, ELEC	C125-128,C145
16				
17	123004-477	1	CAP, 470µF, 16V, ELEC, RADIAL	C366
18	122016-470	3	CAP, 47PF, 100V, CER	C229,C250,C274
19				
20				
21				

Title / ASSY, SUB, MULTISYNC PCB	P/L A044998-01	REV / F
GAMES ENGINEERING PARTS LIST SPECIFICATION	PROJECT:	Page 2 of 4

ITEM	PART NO	QTY	Description	Ref. Designators
22				
23	179118-011	9	CONN, 11 CKT, HDR, .100 CTR	J2-6,J8-10,J13
24	179069-012	1	CONN, 12 CKT, HDR. .250 CTR	J1
25	179261-016	1	CONN, 16 CKT, HDR, .1 X .1 DUAL	J15
26	179261-026	1	CONN, 26 CKT, HDR, .1 X .1 DUAL	J14
27	179177-006	2	CONN, 6 CKT, HDR, .100 CTR	SPEED,VCLK.
28	179177-004	1	CONN, 4 CKT, HDR, .100 CTR	BCLK.
29	179069-009	1	CONN, 9 CKT, HDR, .250 CTR	J12
30	179021-060	1	CONN, HDR,60 CKT, .1 CTR	J7
31				
32				
33	131048-002	6	DIODE, 1N4002	CR5,CR7,CR8,CR13,CR18, CR23
34				
35				
36	131009-213	1	DIODE, 1N4740A, 10V, ZENER, 5%	CR21
37				
38	131027-002	9	DIODE, MV5053, LIGHT EMIT	CR1,CR2,CR6,CR9-12, CR14,CR22
39				
40				
41				
42	137199-002	6	IC, 2149, 45NSEC	30S,30U,30W,40S,40U, 40W
43				
44	137553-002	16	IC, VRAM, 64KX4, 150NSEC	60P,60S,60U,60W,70P, 70S,70U,70W,85P,85S, 85U,85W,95P,95S,95U, 95W
	COMMENT		137553-001, IC, 64KX4 VRAM 120NSEC, AND 137553-003, IC, 64KX4, VRAM,100NSEC, AS SUBSTITUE FOR ITEM 44	
45				
46	137580-001	1	IC, 4066B	205B
47	137546-003	4	IC, 4464, 64K X 4, DRAM	5K,15K,25K,35K
48	137052-001	1	IC, 7406	110C
49	137460-001	1	IC, 74ALS08	90M
50	137517-001	5	IC, 74ALS138	80M,110K,160K,180C, 200M
51	137467-001	1	IC, 74ALS139	180E
52	137470-001	3	IC, 74ALS161	100M,160E,170K
53	137440-001	2	IC, 74ALS245	15M,35M
54	137464-001	2	IC, 74ALS32	160H,200L
55	137548-001	5	IC, 74ALS574	20P,50S,50U,50W,120M
56	137156-001	1	IC, 74ALS74	140M
57	137480-001	2	IC, 74AS00	135U,190E
58	137484-001	2	IC, 74AS08	70Y,140U
59	137522-001	1	IC, 74AS138	60Y
60	137487-001	2	IC, 74AS32	135K,160U
61	137547-001	8	IC, 74AS573	25M,50Y,120P,120W, 120Y,135P,135W,150U

Title / ASSY, SUB, MULTISYNC PCB	P/L A044998-01	REV / F
GAMES ENGINEERING PARTS LIST SPECIFICATION	PROJECT:	Page 3 of 4

ITEM	PART NO	QTY	Description	Ref. Designators
62	137437-001	2	IC, 74F04	150W,160M
63	137583-001	1	IC, 74F11	140K
64	137343-001	1	IC, 74F161	150Y
65	137502-001	2	IC, 74F244	5M,120U
66	137436-001	3	IC, 74F74	120H,135C,135H
67	137605-001	1	IC, 74HC14	195W
68				
69	137268-001	2	IC, 74LS123	40H,50H
70	137177-001	1	IC, 74LS138	195R
71	137056-001	2	IC, 74LS14	75H,185W
72	137417-001	1	IC, 74LS148	170H
73	137128-001	2	IC, 74LS193	185T,195T
74	137060-001	1	IC, 74LS20	150K
75	137038-001	12	IC, 74LS244	60B,140C,140P, 150E,160C,170E,200H, 200J,210H,210J,210K, 210N
76	137134-001	13	IC, 74LS245	30P,30Y,40Y,150C,170C, 190N,200F,200N, 200P,210F,210L,210M, 210P
77	137137-001	3	IC, 74LS259	65C,75C,135Y
78	137144-001	5	IC, 74LS374	30B,85C,95C,185R,185U
79	137146-001	3	IC, 74LS393	120K,140H,190C
80	137023-001	4	IC, 74LS74	135M,150H,160W,175U
81	137597-001	1	IC, 7812	Q4
82	137581-001	1	IC, 7905	Q3
83				
84	137403-001	1	IC, MC1488	210A
85	137263-001	1	IC, MC1489AL	210B
86	137513-001	3	IC, 74AS823	20S,20U,20W
87	137243-001	1	IC, ADC0809	45B
88	137535-006	4	IC, RAM, 8KX8, 150NSEC	200C,200D,210C,210D
89	137614-001	1	IC, AD711KN	15B
90				
91	144008-002	2	OSC, 32MHZ	XOSC1,XOSC4
92				
93				
94				
95	110005-001	1	RES, 0, 5%, 1/4W	R155
96	110000-100	2	RES, 10, 5%, 1/4W	R172,R173
97	110000-101	39	RES, 100, 5%, 1/4W	R1-26,R55,R98-101, R109-111,R113-115, R177,R178
98	110000-104	2	RES, 100K, 5%, 1/4W	R147,R148
99	110000-103	21	RES, 10K, 5%, 1/4W	R74,R75,R84-88, R145,R146,R149,R150, R160,R161,R168-171, R182-184,R190
100	110000-151	2	RES, 150, 5%, 1/4W	R162,R163
101	110000-102	38	RES, 1K, 5%, 1/4W	R29-45,R57-60,R68, R80,R81,R125-131,R134,

Title / ASSY, SUB, MULTISYNC PCB	P/L A044998-01	REV / F
GAMES ENGINEERING PARTS LIST SPECIFICATION	PROJECT:	Page 4 of 4

ITEM	PART NO	QTY	Description	Ref. Designators
				R185,R188,R191,R193, R194,R197
102	110000-225	1	RES, 2.2M, 5%, 1/4W	R189 ?
103	110000-221	10	RES, 220, 5%, 1/4W	R62,R63,R70-73,R76, R124,R151,R152
104	110000-274	1	RES, 270K, 5%, 1/4W	R192
105				
106	110000-330	22	RES, 33, 5%, 1/4W	R89-96,R102-107, R116-123
107	110001-331	1	RES, 330, 5%, 1/2W	R187
108	110000-472	10	RES, 4.7K, 5%,1/4W	R49-54,R61,R77,R78, R132
109	118010-472	1	RES, 4.7KX9, 5%, 1/8W, SIP(10PIN)	RN6
110				
111	110000-471	5	RES, 470, 5%, 1/4W	R46-48,R82,R83
112	118010-471	2	RES, 470X9, 5%, 1/8W, SIP(10PIN)	RN1,RN2
113	110000-473	1	RES, 47K, 5%, 1/4W	R79
114				
115				
116	110000-820	1	RES, 82, 5%, 1/4W	R186
117				
118	118015-001	3	RES, R2R LADDER	RN3-5
119				
120	179259-016	1	SOCKET, 16 PIN, .300"	195U
121	179259-020	1	SOCKET, 20 PIN, .300"	200K
122	179257-024	2	SOCKET, 24 PIN, .600"	200E,210E
123	179257-028	16	SOCKET, 28 PIN, .600"	200R,200S,200T,200U 200V,200W,200X,200Y, 210R,210S,210T,210U, 210V,210W,210X,210Y
124	179257-040	1	SOCKET, 40 PIN, .600"	200A
125	179256-064	1	SOCKET, 64 PIN, .900"	190K
126	179237-068	3	SOCKET, 68 PIN	55L-MSP,120S-PSP, 150S-GSP
127				
128	160031-008	1	SWITCH, 8 POS DIP	SW1
129				
130	179051-001	23	TEST POINT	TP3,+5V1,+5V2,-5V1, BLU.,GND1-9,GRN.,RED., +12V1,+15V1,-22V1, CSYNC.,DIAGN.,RESET., WD-DIS
131				
132	133041-001	6	TRANS, 2N3904	Q5,Q7,Q9,Q11-13
133	133040-001	3	TRANS, 2N3906	Q6,Q8,Q10
134	133042-001	2	TRANS, 2N6044	Q1,Q2
135	178217-001	1	INSULATOR, CRYSTAL,	(XTAL1)
136	144000-011	1	XTAL, 3.6864, STANDUP	XTAL1
137	144008-003	1	XTAL, 48 MHZ, OSCILLATOR MODULE	XOSC2
138	144008-005	1	XTAL, 50 MHZ, OSCILLATOR MODULE	XOSC3

Title / ASSY, SUB, MULTISYNC PCB	P/L A044998-02	Rev / C
GAMES ENGINEERING PARTS LIST SPECIFICATION	PROJECT: HARD DRIVIN	

ATARI GAMES

Drawn by: STAFF Checked by: AJ	Next Assy: A046901-04,05,06
Design Eng: Proj. Eng: JM	Comp. Eng: Mfg. Eng: DW
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE						
B	REVISED PER ECN 13956						
C	REVISED PER ECN 14092	11-27-90	[illegible]				

ITEM	PART NO	QTY	Description	Ref. Designators
1	044999-01	1	P.C. Board	
2				
3				
4				
5	122015-102	24	CAP, .001µF, 50V, 10%	C44-63,C228,C359,C360, C378
6				
7	122002-103	1	CAP, .01µF, 50V, CER	C2
8	122002-104	258	CAP, .1µF, 50V, CER	C3-14,C16,C19-21, C24-43,C65-78,C80-82, C85-87,C94-106, C114-117,C123,C124, C129-137,C140,C141, C143,C144,C146-189, C193-202,C204-227, C230-238,C243-249, C251-259,C264-273, C275-293,C298,C299, C306-309,C315-320, C330-333,C341,342, C349-352,C354,C355, C358,C364,C365,C367, C369-377,C379
9	122015-224	1	CAP, .22µF, 50V, CER	C142
10	122016-102	5	CAP, 1000PF, 100V, CER	C138,C139,C361-363
11	122016-101	4	CAP, 100PF, 100V, CER	C83,C84,C335,C336,
12	124000-107	1	CAP, 100µF, 35V, ELEC	C1
13	122016-100	5	CAP, 10PF, 100V, CER	C79,C323-326
14	127001-106	1	CAP, 10µF, 20V, TANT	C368
15	124000-106	5	CAP, 10µF, 35V, ELEC	C125-128,C145
16				
17	123004-477	1	CAP, 470µF, 16V, ELEC, RADIAL	C366
18	122016-470	3	CAP, 47PF, 100V, CER	C229,C250,C274
19				
20				
21				

ITEM	PART NO	QTY	Description	Ref. Designators
22				
23	179118-011	9	CONN, 11 CKT, HDR, .100 CTR	J2-6,J8-10,J13
24	179069-012	1	CONN, 12 CKT, HDR. .250 CTR	J1
25	179261-016	1	CONN, 16 CKT, HDR, .1 X .1 DUAL	J15
26	179261-026	1	CONN, 26 CKT, HDR, .1 X .1 DUAL	J14
27	179177-006	2	CONN, 6 CKT, HDR, .100 CTR	SPEED,VCLK.
28	179177-004	1	CONN, 4 CKT, HDR, .100 CTR	BCLK.
29	179069-009	1	CONN, 9 CKT, HDR, .250 CTR	J12
30	179021-060	1	CONN, HDR,60 CKT, .1 CTR	J7
31				
32				
33	131048-002	6	DIODE, 1N4002	CR5,CR7,CR8,CR13,CR18, CR23
34				
35				
36	131009-213	1	DIODE, 1N4740A, 10V, ZENER, 5%	CR21
37				
38	131027-002	9	DIODE, MV5053, LIGHT EMIT	CR1,CR2,CR6,CR9-12, CR14,CR22
39				
40				
41				
42	137199-002	6	IC, 2149, 45NSEC	30S,30U,30W,40S,40U, 40W
43				
44	137553-002	16	IC, VRAM, 64KX4, 150NSEC	60P,60S,60U,60W,70P, 70S,70U,70W,85P,85S, 85U,85W,95P,95S,95U, 95W
	COMMENT		137553-001, IC, 64KX4 VRAM 120NSEC,AND 137553-003, IC, 64KX4, VRAM, 100NSEC, AS SUBSTITUE FOR ITEM 44	
45				
46	137580-001	1	IC, 4066B	205B
47				
48	137052-001	1	IC, 7406	110C
49	137460-001	1	IC, 74ALS08	90M
50	137517-001	5	IC, 74ALS138	80M,110K,160K,180C, 200M
51	137467-001	1	IC, 74ALS139	180E
52	137470-001	3	IC, 74ALS161	100M,160E,170K
53				
54	137464-001	2	IC, 74ALS32	160H,200L
55	137548-001	5	IC, 74ALS574	20P,50S,50U,50W,120M
56	137156-001	1	IC, 74ALS74	140M
57	137480-001	2	IC, 74AS00	135U,190E
58	137484-001	2	IC, 74AS08	70Y,140U
59	137522-001	1	IC, 74AS138	60Y
60	137487-001	2	IC, 74AS32	135K,160U
61	137547-001	7	IC, 74AS573	50Y,120P,120W,120Y, 135P,135W,150U

ITEM	PART NO	QTY	Description	Ref. Designators
62	137437-001	2	IC, 74F04	150W,160M
63	137583-001	1	IC, 74F11	140K
64	137343-001	1	IC, 74F161	150Y
65	137502-001	1	IC, 74F244	120U
66	137436-001	3	IC, 74F74	120H,135C,135H
67	137605-001	1	IC, 74HC14	195W
68				
69	137268-001	2	IC, 74LS123	40H,50H
70	137177-001	1	IC, 74LS138	195R
71	137056-001	2	IC, 74LS14	75H,185W
72	137417-001	1	IC, 74LS148	170H
73	137128-001	2	IC, 74LS193	185T,195T
74	137060-001	1	IC, 74LS20	150K
75	137038-001	12	IC, 74LS244	60B,140C,140P, 150E,160C,170E,200H, 200J,210H,210J,210K, 210N
76	137134-001	13	IC, 74LS245	30P,30Y,40Y,150C,170C, 190N,200F,200N, 200P,210F,210L,210M, 210P
77	137137-001	3	IC, 74LS259	65C,75C,135Y
78	137144-001	5	IC, 74LS374	30B,85C,95C,185R,185U
79	137146-001	3	IC, 74LS393	120K,140H,190C
80	137023-001	4	IC, 74LS74	135M,150H,160W,175U
81	137597-001	1	IC, 7812	Q4
82	137581-001	1	IC, 7905	Q3
83				
84	137403-001	1	IC, MC1488	210A
85	137263-001	1	IC, MC1489AL	210B
86	137513-003	3	IC, 74BCT29823	20S,20U,20W
87	137243-001	1	IC, ADC0809	45B
88	137535-004	4	IC, RAM, 8KX8, 100NSEC	200C,200D,210C,210D
89	137614-001	1	IC, AD711KN	15B
90				
91	144008-002	2	OSC, 32MHZ	XOSC1,XOSC4
92				
93				
94				
95	110005-001	1	RES, 0, 5%, 1/4W	R155
96	110000-100	2	RES, 10, 5%, 1/4W	R172,R173
97	110000-101	39	RES, 100, 5%, 1/4W	R1-26,R55,R98-101, R109-111,R113-115, R177,R178
98	110000-104	2	RES, 100K, 5%, 1/4W	R147,R148
99	110000-103	21	RES, 10K, 5%, 1/4W	R74,R75,R84-88, R145,R146,R149,R150, R160,R161,R168-171, R182-184,R190
100	110000-151	2	RES, 150, 5%, 1/4W	R162,R163
101	110000-102	38	RES, 1K, 5%, 1/4W	R29-45,R57-60,R68, R80,R81,R125-131,R134,

Title / ASSY, SUB, MULTISYNC PCB	P/L A044998-02	REV / C
GAMES ENGINEERING PARTS LIST SPECIFICATION	PROJECT: HARD DRIVIN	Page 4 of 4

ITEM	PART NO	QTY	Description	Ref. Designators
				R185,R188,R191,R193, R194,R197
102	110000-225	1	RES, 2.2M, 5%, 1/4W	R189
103	110000-221	10	RES, 220, 5%, 1/4W	R62,R63,R70-73,R76, R124,R151,R152
104	110000-274	1	RES, 270K, 5%, 1/4W	R192
105				
106	110000-330	22	RES, 33, 5%, 1/4W	R89-96,R102-107, R116-123
107	110001-331	1	RES, 330, 5%, 1/2W	R187
108	110000-472	10	RES, 4.7K, 5%,1/4W	R49-54,R61,R77,R78, R132
109	118010-472	1	RES, 4.7KX9, 5%, 1/8W, SIP(10PIN)	RN6
110				
111	110000-471	5	RES, 470, 5%, 1/4W	R46-48,R82,R83
112	118010-471	2	RES, 470X9, 5%, 1/8W, SIP(10PIN)	RN1,RN2
113	110000-473	1	RES, 47K, 5%, 1/4W	R79
114				
115				
116	110000-820	1	RES, 82, 5%, 1/4W	R186
117				
118	118015-001	3	RES, R2R LADDER	RN3-5
119	179259-018	4	SOCKET, 18 PIN, .300	5K,15K,25K,35K
120	179259-016	1	SOCKET, 16 PIN, .300"	195U
121	179259-020	5	SOCKET, 20 PIN, .300"	5M,15M,25M,35M,200K
122	179257-024	2	SOCKET, 24 PIN, .600"	200E,210E
123	179257-028	16	SOCKET, 28 PIN, .600"	200R,200S,200T,200U 200V,200W,200X,200Y, 210R,210S,210T,210U, 210V,210W,210X,210Y
124	179257-040	1	SOCKET, 40 PIN, .600"	200A
125	179256-064	1	SOCKET, 64 PIN, .900"	190K
126	179237-068	3	SOCKET, 68 PIN	55L-MSP,120S-PSP, 150S-GSP
127				
128	160031-008	1	SWITCH, 8 POS DIP	SW1
129				
130	179051-001	23	TEST POINT	TP3,+5V1,+5V2,-5V1, BLU.,GND1-9,GRN.,RED., +12V1,+15V1,-22V1, CSYNC.,DIAGN.,RESET., WD-DIS
131				
132	133041-001	6	TRANS, 2N3904	Q5,Q7,Q9,Q11-13
133	133040-001	3	TRANS, 2N3906	Q6,Q8,Q10
134	133042-001	2	TRANS, 2N6044	Q1,Q2
135				
136	144000-011	1	XTAL, 3.6864, STANDUP	XTAL1
137	144008-003	1	XTAL, 48 MHZ, OSCILLATOR MODULE	XOSC2
138				

Title / ASSY, H.D. COMPACT MULTISYNC PCB	P/L A046901-01	Rev / C
GAMES ENGINEERING PARTS LIST SPECIFICATION	PROJECT:	Page 1 of 1

ATARI GAMES

Drawn by: STAFF	Next Assy:
Checked by:	
Design Eng:	Comp. Eng:
Proj. Eng:	Mfg. Eng:
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE						
B	PER ECN 13506						
C	PER ECN 13516						

ITEM	PART NO	QTY	Description	Ref. Designators
1	A044998-01	1	ASSY, SUB, MULTISYNC PCB	
2				
3	137538-002	2	IC, 34010-50	150S-GSP,55L-MSP
4	137559-001	1	IC, 34012-50	120S-PSP
5	137540-150	1	IC, 48T02-15, RAM	200E
6	137442-150	1	IC, 48Z02-15, RAM	210E
7	137414-002	1	IC, 68010	190K
8	137543-001	1	IC, 68681	200A
9	136068-1168	1	IC, PROM, 82S123	195U
10				
11				
12				
13	136068-2101	1	IC, EPROM,137448-200	210R
14	136068-2102	1	IC, EPROM,137448-200	200R
15				
16				
17				
18	136068-2103	1	IC, EPROM,137448-200	210S
19	136068-2104	1	IC, EPROM,137448-200	200S
20				
21	136068-1111	1	IC, EPROM,137448-200	210W
22	136068-1112	1	IC, EPROM,137448-200	200W
23				
24				
25				
26	136068-1113	1	IC, EPROM,137448-200	210X
27	136068-1114	1	IC, EPROM,137448-200	200X
28				
29	179178-002	3	CONN, RCPT, 2 CKT NOTE: PLACE RCPT FOR SPEED ON 'B' BCLK ON 'QB' VCLK ON 'QB/2'	SPEED,BCLK,VCLK

Title / ASSY, MULTISYNC PCB	P/L A046901-07	Rev /A
GAMES ENGINEERING	PROJECT: R.D. PANORAMA N. AMERICA	

PARTS LIST SPECIFICATION

ATARI GAMES

Drawn by: STAFF	Next Assy:
Checked by: L B Fitts 4-1-91	
Design Eng:	Comp. Eng:
Proj. Eng: J. Margolin 4-1-91	Mfg. Eng: 4-1-91
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE	4-1-91	jm				

ITEM	PART NO	QTY	Description	Ref. Designators
1	A044998-02	1	ASSY, SUB, MULTISYNC PCB	
2				
3	137538-002	1	IC, 34010-50	150S-GSP
4	137559-001	1	IC, 34012-50	120S-PSP
5	137540-150	1	IC, 48T02-15, RAM	200E
6	137442-150	1	IC, 48Z02-15, RAM	210E
7	137414-002	1	IC, 68010	190K
8	137543-001	1	IC, 68681	200A
9	136068-1168	1	IC, PROM, 82S123	195U
10				
11	137412-115	1	IC, SLAPSTIC	200K
	COMMENT		137412-117, AS SUB FOR ITEM 11	
12				
13	136088-2001	1	IC, EPROM,137448-200	210R
14	136088-2002	1	IC, EPROM,137448-200	200R
15	136088-2003	1	IC, EPROM,137448-200	210S
16	136088-2004	1	IC, EPROM,137448-200	200S
17	136088-2005	1	IC, EPROM,137448-200	210T
18	136088-2006	1	IC, EPROM,137448-200	200T
19	136088-2007	1	IC, EPROM,137448-200	210U
20	136088-2008	1	IC, EPROM,137448-200	200U
21	136088-2009	1	IC, EPROM,137448-200	210V
22	136088-2010	1	IC, EPROM,137448-200	200V
23	136088-2011	1	IC, EPROM,137448-200	210W
24	136088-2012	1	IC, EPROM,137448-200	200W
25	136088-2013	1	IC, EPROM,137448-200	210X
26	136088-2014	1	IC, EPROM,137448-200	200X
27	136088-2015	1	IC, EPROM,137448-200	210Y
28	136088-2016	1	IC, EPROM,137448-200	200Y
29	179178-002	3	CONN, RCPT, 2 CKT	SPEED,BCLK,VCLK
			NOTE: PLACE RCPT FOR SPEED ON 'B' BCLK ON 'QB' VCLK ON 'QB/2'	

TITLE / ASSY, MULTISYNC BOARD SET	P/L A049345-01	REV / C
COIN-OP ENGINEERING PARTS LIST SPECIFICATION	PROJECT: RACE DR. PANORAMA MODEL NO: NORTH AMERICAN	PAGE 1 OF 1

ATARI GAMES

Drawn by: STAFF	Next Assy:
Checked by: L.FRITTS 4/1/91	
Design Eng:	Comp. Eng:
Proj. Eng: RMoncrief 4/1/91	Mfg. Eng: Wrightnour 4/91
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE						
B	PER ECN 14206	4/18/91					
C	PER ECN 14247	5/7/91	EO				

ITEM	PART NO	QTY	DESCRIPTION
1	A046901-07	1	ASSY, MULTISYNC PCB
2	A047046-04	1	ASSY, DRIVER ADSP II PCB
3			
4			
5			
6			
7			
8			
9	178171-1616	3	STANDOFF, 1/4 RND, #6-32 X 1, ALUM
10	72-036S	6	WASHER, LOCK, EXT, #6, STEEL/ZINC
11	72-1606F	6	SCREW, PAN, #6-32 X 3/8, X-REC, ZINC
12	175014-1025	6	WASHER, FLAT, .156 X .312, STEEL/ZINC
13			
14			
15			
16	A047332-01	1	ASSY, RIBBON CABLE, PCB
17			

Title / ASSY, H.D. COMPACT MULTISYNC PCB	P/L A046901-02	Rev /A
GAMES ENGINEERING PARTS LIST SPECIFICATION	PROJECT: H.D. GERMAN VERSION	Page 1 of 1

ATARI GAMES

Drawn by: STAFF	Next Assy:
Checked by: [signature] 6-16-89	
Design Eng: [signature]	Comp. Eng:
Proj. Eng:	Mfg. Eng: [signature] 6-19-89
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE	6-16-89	JM				

ITEM	PART NO	QTY	Description	Ref. Designators
1	A044998-01	1	ASSY, SUB, MULTISYNC PCB	
2				
3	137538-002	2	IC, 34010-50	150S-GSP,55L-MSP
4	137559-001	1	IC, 34012-50	120S-PSP
5	137540-150	1	IC, 48T02-15, RAM	200E
6	137442-150	1	IC, 48Z02-15, RAM	210E
7	137414-002	1	IC, 68010	190K
8	137543-001	1	IC, 68681	200A
9	136068-1168	1	IC, PROM, 82S123	195U
10				
11				
12				
13	136068-2201	1	IC, EPROM,137448-200	210R
14	136068-2202	1	IC, EPROM,137448-200	200R
15				
16				
17				
18	136068-2203	1	IC, EPROM,137448-200	210S
19	136068-2204	1	IC, EPROM,137448-200	200S
20				
21	136068-1111	1	IC, EPROM,137448-200	210W
22	136068-1112	1	IC, EPROM,137448-200	200W
23				
24				
25				
26	136068-1113	1	IC, EPROM,137448-200	210X
27	136068-1114	1	IC, EPROM,137448-200	200X
28				
29	179178-002	3	CONN, RCPT, 2 CKT NOTE: PLACE RCPT FOR SPEED ON 'B' BCLK ON 'QB' VCLK ON 'QB/2'	SPEED,BCLK,VCLK

Title / ASSY, H.D. COMPACT MULTISYNC PCB	P/L A046901-06	Rev /D
GAMES ENGINEERING	PROJECT: RACE DRIVIN, GERMAN	

PARTS LIST SPECIFICATION

ATARI GAMES

Drawn by: STAFF	Next Assy:
Checked by: A JACKSON 3-12-90	
Design Eng:	Comp. Eng:
Proj. Eng: J MARGOLIN 3-20-90	Mfg. Eng: D W 3-29-90
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE						
B	REVISED PER ECN 14009						
C	REVISED PER ECN 14155	1-91					
D	REVISED PER ECN 14166	2-91	gm 2-7-91				

ITEM	PART NO	QTY	Description	Ref. Designators
1	A044998-02	1	ASSY, SUB, MULTISYNC PCB	
2				
3	137538-002	1	IC, 34010-50	150S-GSP
4	137559-001	1	IC, 34012-50	120S-PSP
5	137540-150	1	IC, 48T02-15, RAM	200E
6	137442-150	1	IC, 48Z02-15, RAM	210E
7	137414-002	1	IC, 68010	190K
8	137543-001	1	IC, 68681	200A
9	136068-1168	1	IC, PROM, 82S123	195U
10				
11	137412-115	1	IC, SLAPSTIC	200K
12	COMMENT		137412-117 IS SUB. FOR 137412-115	
13	136078-5201	1	IC, EPROM,137448-200	210R
14	136078-5202	1	IC, EPROM,137448-200	200R
15	136078-5203	1	IC, EPROM,137448-200	210S
16	136078-5204	1	IC, EPROM,137448-200	200S
17	136078-5205	1	IC, EPROM,137448-200	210T
18	136078-5206	1	IC, EPROM,137448-200	200T
19	136078-4007	1	IC, EPROM,137448-200	210U
20	136078-4008	1	IC, EPROM,137448-200	200U
21	136078-4009	1	IC, EPROM,137448-200	210V
22	136078-4010	1	IC, EPROM,137448-200	200V
23	136078-1011	1	IC, EPROM,137448-200	210W
24	136078-1012	1	IC, EPROM,137448-200	200W
25	136078-1013	1	IC, EPROM,137448-200	210X
26	136078-1014	1	IC, EPROM,137448-200	200X
27	136078-4015	1	IC, EPROM,137448-200	210Y
28	136078-4016	1	IC, EPROM,137448-200	200Y
29	179178-002	3	CONN, RCPT, 2 CKT	SPEED,BCLK,VCLK
			NOTE: PLACE RCPT FOR	
			SPEED ON 'B'	
			BCLK ON 'QB'	
			VCLK ON 'QB/2'	

Title / ASSY, COMPACT MULTISYNC	P/L A046901-04	Rev /E
GAMES ENGINEERING	PROJECT: RACE DRIVIN NO. AMERICAN	

PARTS LIST SPECIFICATION

ATARI GAMES

Drawn by: STAFF	Next Assy:
Checked by: A JACKSON 3-12-90	
Design Eng:	Comp. Eng:
Proj. Eng: J MARGOLIN 3-20-90	Mfg. Eng: D W 3-29-90
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE						
B	REVISED PER ECN 14009						
C	REVISED PER ECN 14102	1126					
D	REVISED PER ECN 14148	1-91					
E	REVISED PER ECN 14164	2-91	JM 8-7-91				

ITEM	PART NO	QTY	Description	Ref. Designators
1	A044998-02	1	ASSY, SUB, MULTISYNC PCB	
2				
3	137538-002	1	IC, 34010-50	150S-GSP
4	137559-001	1	IC, 34012-50	120S-PSP
5	137540-150	1	IC, 48T02-15, RAM	200E
6	137442-150	1	IC, 48Z02-15, RAM	210E
7	137414-002	1	IC, 68010	190K
8	137543-001	1	IC, 68681	200A
9	136068-1168	1	IC, PROM, 82S123	195U
10				
11	137412-115	1	IC, SLAPSTIC	200K
12	COMMENT		137412-117 IS SUB. FOR 137412-115	
13	136078-5001	1	IC, EPROM,137448-200	210R
14	136078-5002	1	IC, EPROM,137448-200	200R
15	136078-5003	1	IC, EPROM,137448-200	210S
16	136078-5004	1	IC, EPROM,137448-200	200S
17	136078-5005	1	IC, EPROM,137448-200	210T
18	136078-5006	1	IC, EPROM,137448-200	200T
19	136078-4007	1	IC, EPROM,137448-200	210U
20	136078-4008	1	IC, EPROM,137448-200	200U
21	136078-4009	1	IC, EPROM,137448-200	210V
22	136078-4010	1	IC, EPROM,137448-200	200V
23	136078-1011	1	IC, EPROM,137448-200	210W
24	136078-1012	1	IC, EPROM,137448-200	200W
25	136078-1013	1	IC, EPROM,137448-200	210X
26	136078-1014	1	IC, EPROM,137448-200	200X
27	136078-4015	1	IC, EPROM,137448-200	210Y
28	136078-4016	1	IC, EPROM,137448-200	200Y
29	179178-002	3	CONN, RCPT, 2 CKT	SPEED,BCLK,VCLK
			NOTE: PLACE RCPT FOR SPEED ON 'B' BCLK ON 'QB' VCLK ON 'QB/2'	

Title / ASSY, H.D. COMPACT MULTISYNC PCB	P/L A046901-03	Rev /A
GAMES ENGINEERING PARTS LIST SPECIFICATION	PROJECT: H.D. BRITISH VERSION	Page 1 of 1

ATARI GAMES

Drawn by: STAFF	Next Assy:
Checked by: G. Jackson 6-16-89	
Design Eng: J. Magaha	Comp. Eng:
Proj. Eng:	Mfg. Eng: David L. Ulrich 6-19-89
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE	5-6-89	JM				

ITEM	PART NO	QTY	Description	Ref. Designators
1	A044998-01	1	ASSY, SUB, MULTISYNC PCB	
2				
3	137538-002	2	IC, 34010-50	150S-GSP,55L-MSP
4	137559-001	1	IC, 34012-50	120S-PSP
5	137540-150	1	IC, 48T02-15, RAM	200E
6	137442-150	1	IC, 48Z02-15, RAM	210E
7	137414-002	1	IC, 68010	190K
8	137543-001	1	IC, 68681	200A
9	136068-1168	1	IC, PROM, 82S123	195U
10				
11				
12				
13	136068-2101	1	IC, EPROM,137448-200	210R
14	136068-2102	1	IC, EPROM,137448-200	200R
15				
16				
17				
18	136068-2103	1	IC, EPROM,137448-200	210S
19	136068-2104	1	IC, EPROM,137448-200	200S
20				
21	136068-2911	1	IC, EPROM,137448-200	210W
22	136068-2912	1	IC, EPROM,137448-200	200W
23				
24				
25				
26	136068-2913	1	IC, EPROM,137448-200	210X
27	136068-2914	1	IC, EPROM,137448-200	200X
28				
29	179178-002	3	CONN, RCPT, 2 CKT NOTE: PLACE RCPT FOR SPEED ON 'B' BCLK ON 'QB' VCLK ON 'QB/2'	SPEED,BCLK,VCLK

Title / ASSY, COMPACT MULTISYNC PCB	P/L A046901-05	Rev /D
GAMES ENGINEERING	PROJECT: RACE DRIVIN BRITISH	

PARTS LIST SPECIFICATION

ATARI GAMES

Drawn by: STAFF	Next Assy:
Checked by: A JACKSON 3-12-90	
Design Eng:	Comp. Eng:
Proj. Eng: J MARGOLIN 3-20-90	Mfg. Eng: D W 3-29-90
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE						
B	REVISED PER ECN 14009						
C	REVISED PER ECN 14147	1-91					
D	REVISED PER ECN 14165	2-91	JM 2-7-91				

ITEM	PART NO	QTY	Description	Ref. Designators
1	A044998-02	1	ASSY, SUB, MULTISYNC PCB	
2				
3	137538-002	1	IC, 34010-50	150S-GSP
4	137559-001	1	IC, 34012-50	120S-PSP
5	137540-150	1	IC, 48T02-15, RAM	200E
6	137442-150	1	IC, 48Z02-15, RAM	210E
7	137414-002	1	IC, 68010	190K
8	137543-001	1	IC, 68681	200A
9	136068-1168	1	IC, PROM, 82S123	195U
10				
11	137412-115	1	IC, SLAPSTIC	200K
12	COMMENT		137412-117 IS SUB. FOR 137412-115	
13	136078-5001	1	IC, EPROM,137448-200	210R
14	136078-5002	1	IC, EPROM,137448-200	200R
15	136078-5003	1	IC, EPROM,137448-200	210S
16	136078-5004	1	IC, EPROM,137448-200	200S
17	136078-5005	1	IC, EPROM,137448-200	210T
18	136078-5006	1	IC, EPROM,137448-200	200T
19	136078-4007	1	IC, EPROM,137448-200	210U
20	136078-4008	1	IC, EPROM,137448-200	200U
21	136078-4009	1	IC, EPROM,137448-200	210V
22	136078-4010	1	IC, EPROM,137448-200	200V
23	136078-1111	1	IC, EPROM,137448-200	210W
24	136078-1112	1	IC, EPROM,137448-200	200W
25	136078-1013	1	IC, EPROM,137448-200	210X
26	136078-1014	1	IC, EPROM,137448-200	200X
27	136078-4015	1	IC, EPROM,137448-200	210Y
28	136078-4016	1	IC, EPROM,137448-200	200Y
29	179178-002	3	CONN, RCPT, 2 CKT	SPEED,BCLK,VCLK
			NOTE: PLACE RCPT FOR SPEED ON 'B' BCLK ON 'QB' VCLK ON 'QB/2'	

Title / ASSY, STUN RUNNER MULTISYNC PCB	P/L A046901-51	Rev /C
GAMES ENGINEERING PARTS LIST SPECIFICATION	PROJECT: STUN RUNNER(IRELAND)	Page 1 of 1

ATARI GAMES

Drawn by: STAFF	Next Assy:
Checked by: A.J.	
Design Eng: J. Margolin	Comp. Eng:
Proj. Eng: Ed Rotberg	Mfg. Eng: 9-22-89
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
C	PRODUCTION RELEASE	9-21-89	JM				

ITEM	PART NO	QTY	Description	Ref. Designators
1	A044998-11	1	ASSY, SUB, MULTISYNC PCB	
2				
3	137538-002	1	IC, 34010-50	150S-GSP,
4	137559-001	1	IC, 34012-50	120S-PSP
5				
6	137442-150	2	IC, 48Z02-15, RAM	200E,210E
7	137414-002	1	IC, 68010	190K
8	137412-117	1	IC, SLAPSTIC	200K
9				
10				
11				
12				
13	136070-2101	1	IC, OTP,27C512,200NS,137454-200	210R
14	136070-2102	1	IC, OTP,27C512,200NS,137454-200	200R
15	136070-2003	1	IC, EPROM,27C512,200NS,137448-200	210S
16	136070-2004	1	IC, EPROM,27C512,200NS,137448-200	200S
17	136070-2005	1	IC, EPROM,27C512,200NS,137448-200	210T
18	136070-2006	1	IC, EPROM,27C512,200NS,137448-200	200T
19	136070-2107	1	IC, OTP,27C512,200NS,137454-200	210U
20	136070-2108	1	IC, OTP,27C512,200NS,137454-200	200U
21	136070-2109	1	IC, OTP,27C512,200NS,137454-200	210V
22	136070-2110	1	IC, OTP,27C512,200NS,137454-200	200V
23	136070-2111	1	IC, EPROM,27C512,200NS,137448-200	210W
24	136070-2112	1	IC, EPROM,27C512,200NS,137448-200	200W
25				
26				
27				
28				
29	179178-002	4	CONN, RCPT, 2 CKT NOTE: PLACE RCPT FOR SPEED ON 'A' 'B' BCLK ON 'QB' VCLK ON 'QB/2' NOTE: 1. SEE ASSEMBLY DRAWING A044998-11	SPEED,BCLK,VCLK

Title / ASSY, STUN RUNNER MULTISYNC PCB	P/L A046901-11	Rev /D
GAMES ENGINEERING ~~PARTS LIST SPECIFICATION~~	PROJECT: STUN RUNNER	Page 1 of 1

ATARI GAMES

Drawn by: STAFF Checked by: A.J.	Next Assy:
Design Eng: J MARGOLIN	Comp. Eng:
Proj. Eng: E ROTBERG	Mfg. Eng: D W
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE						
B	REV PER ECN 13566						
C	REV PER ECN 13641						
D	REV PER ECN 13676	10-5-89					

ITEM	PART NO	QTY	Description	Ref. Designators
1	A044998-11	1	ASSY, SUB, MULTISYNC PCB	
2				
3	137538-002	1	IC, 34010-50	150S-GSP,
4	137559-001	1	IC, 34012-50	120S-PSP
5				
6	137442-150	2	IC, 48Z02-15, RAM	200E,210E
7	137414-002	1	IC, 68010	190K
8	137412-117	1	IC, SLAPSTIC	200K
9				
10				
11				
12				
13	136070-2101	1	IC, OTP,27C512,200NS,137454-200	210R
14	136070-2102	1	IC, OTP,27C512,200NS,137454-200	200R
15	136070-2103	1	IC, EPROM,27C512,200NS,137448-200	210S
16	136070-2104	1	IC, EPROM,27C512,200NS,137448-200	200S
17	136070-2105	1	IC, EPROM,27C512,200NS,137448-200	210T
18	136070-2106	1	IC, EPROM,27C512,200NS,137448-200	200T
19	136070-2107	1	IC, OTP,27C512,200NS,137454-200	210U
20	136070-2108	1	IC, OTP,27C512,200NS,137454-200	200U
21	136070-2109	1	IC, OTP,27C512,200NS,137454-200	210V
22	136070-2110	1	IC, OTP,27C512,200NS,137454-200	200V
23	136070-2111	1	IC, OTP,27C512,200NS,137454-200	210W
24	136070-2112	1	IC, OTP,27C512,200NS,137454-200	200W
25				
26				
27				
28				
29	179178-002	4	CONN, RCPT, 2 CKT NOTE: PLACE RCPT FOR SPEED ON 'A' 'B' BCLK ON 'QB' VCLK ON 'QB/2'	SPEED,BCLK,VCLK

TITLE / PROGRAMMED MEMORY & LOGIC, MULTISYNC PCB P/L A046901-21P		REV / A
COIN-OP ENGINEERING PARTS LIST SPECIFICATION	PROJECT: STEEL TALONS MODEL NO: 52300	PAGE 1 OF 1

ATARI GAMES

Drawn by: COMPONENTS ENG	Next Assy:
Checked by: J BELL 9/19/91	
Design Eng:	Comp. Eng:
Proj. Eng: 9/20/91	Mfg. Eng: 9-20-91
Ind. Design:	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE	9/19/91					

ITEM	PART NO	QTY	DESCRIPTION	CHECKSUM	REV
1	136087-1001	1	IC,PR EPROM,STEEL TALONS,137448-200,210R	7E01	A
2	136087-1002	1	IC,PR EPROM,STEEL TALONS,137448-200,200R	9502	A
3	136087-1003	1	IC,PR EPROM,STEEL TALONS,137448-200,210S	A903	B
4	136087-1004	1	IC,PR EPROM,STEEL TALONS,137448-200,200S	E604	B
5	136087-1005	1	IC,PR EPROM,STEEL TALONS,137448-200,210T	5C05	B
6	136087-1006	1	IC,PR EPROM,STEEL TALONS,137448-200,200T	4106	B
7	136087-1007	1	IC,PR EPROM,STEEL TALONS,137448-200,210U	3C07	B
8	136087-1008	1	IC,PR EPROM,STEEL TALONS,137448-200,200U	BE08	B
9	136087-1009	1	IC,PR EPROM,STEEL TALONS,137448-200,210V	1E09	A
10	136087-1010	1	IC,PR EPROM,STEEL TALONS,137448-200,200V	D510	A
11	136087-1011	1	IC,PR EPROM,STEEL TALONS,137448-200,210W	8811	A
12	136087-1012	1	IC,PR EPROM,STEEL TALONS,137448-200,200W	D712	A
13	136087-1013	1	IC,PR EPROM,STEEL TALONS,137448-200,210X	2A13	A
14	136087-1014	1	IC,PR EPROM,STEEL TALONS,137448-200,200X	E614	A
15	136087-1015	1	IC,PR EPROM,STEEL TALONS,137448-200,210Y	3E15	A
16	136087-1016	1	IC,PR EPROM,STEEL TALONS,137448-200,200Y	0816	A
17	136087-9001	1	IC,PR FPLA,STEEL TALONS,137684-035,200K	99FA	A

Title / ASSY, STEEL TALONS, MULTISYNC PCB	P/L A046901-21	Rev /B
GAMES ENGINEERING PARTS LIST SPECIFICATION	PROJECT: STEEL TALONS	Page 1 of 1

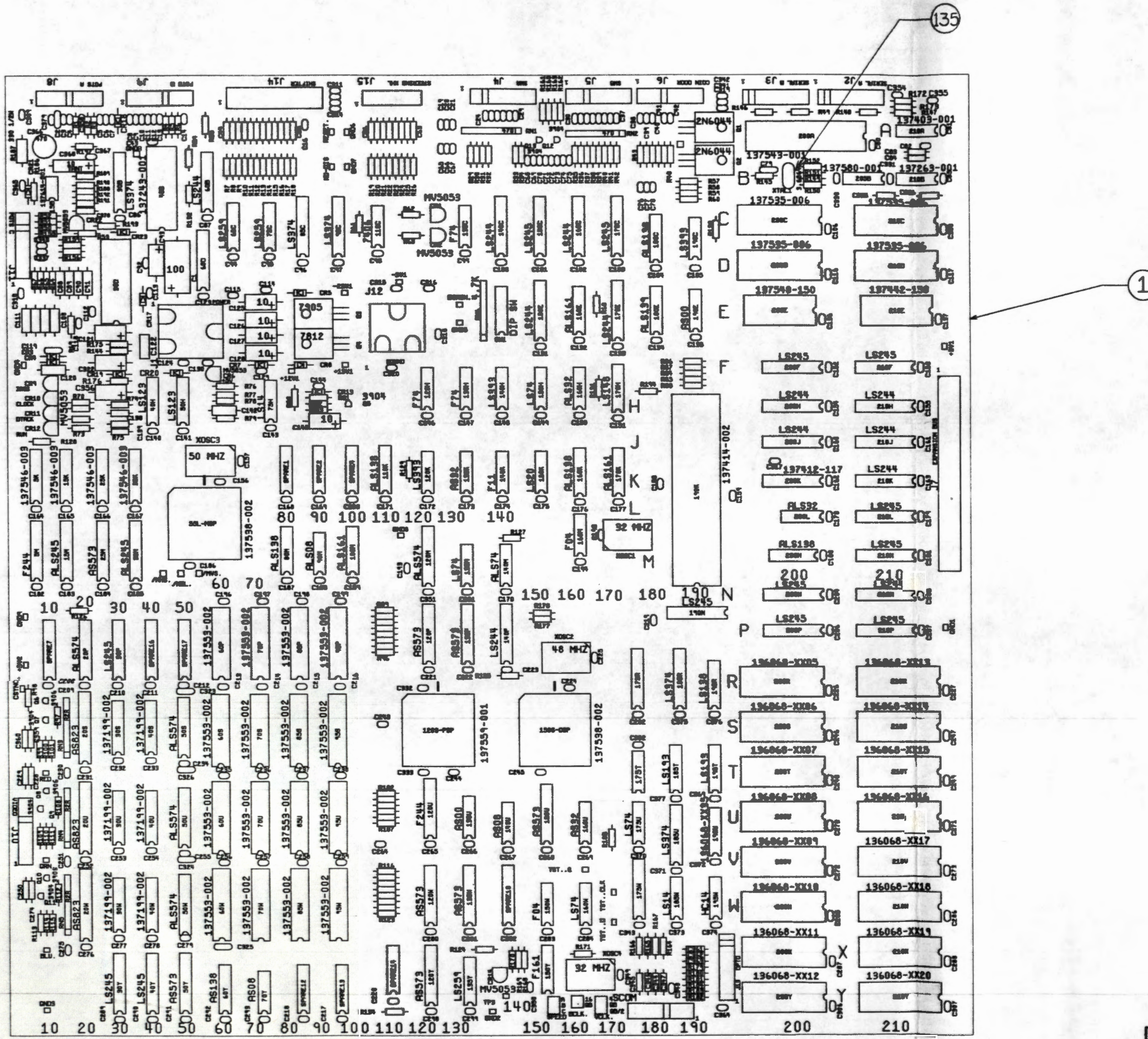
ATARI GAMES

Drawn by: STAFF	Next Assy:
Checked by: FRITTS 6-3-91	
Design Eng: MARGOLIN 6-17-91	Comp. Eng:
Proj. Eng: Ed Logan 10.7.91	Mfg. Eng: D W 6-17-91
Ind. Design: W	Qual. Eng:

REV	DESCRIPTION	DATE	APPR	REV	DESCRIPTION	DATE	APPR
A	PRODUCTION RELEASE		EC				
B	REV PER ECN 14379						

ITEM	PART NO	QTY	Description	Ref. Designators
1	A044998-03	1	ASSY, SUB, MULTISYNC	
2	A046901-21P	1	PROGRAMMED MEMORY AND LOGIC	
3	137538-002	2	IC, 34010-50	150S-GSP,55L-MSP
4	137559-001	1	IC, 34012-50	120S-PSP
5	137540-150	1	IC, 48T02-15, RAM	200E
6	137442-150	1	IC, 48Z02-15, RAM	210E
7	137414-002	1	IC, 68010	190K
8	137545-001	1	IC, AD7582	30D
9				
10	179178-002	3	CONN, RCPT, 2 CKT	SPEED,BCLK,VCLK
			NOTE: PLACE RCPT FOR SPEED ON 'B' BCLK ON 'QB' VCLK ON 'QB/2'	

REVISIONS					
SYM	DESCRIPTION	DATE	INCORP	CHECK	APPROVED
A	PRODUCTION RELEASE	3-8-89	DIEU	AJ	JM RM
B	REV PER ECN 13481	5-25-89	DIEU	AJ	JM
C	REV PER ECN 13482	5-25-89	DIEU	AJ	JM
D	REV PER ECN 13517	6-14-89	C.R.P.	[illegible]	
E	REV PER ECN 13817	4-5-90	DIEU	[illegible]	[illegible]
F	REV PER ECN 14093	11-26-90	LBF	[illegible]	[illegible]



NOTE:

1. PLACE RCPT FOR SPEED ON 'B' -BCLK ON 'QB' -VCLK ON 'QB/2'

A046901	HARD DRIVIN
NEXT ASSY	FIRST USED ON

NOTICE TO ALL PERSONS RECEIVING THIS DRAWING

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
ANGLES ± 1°
.XX = ± .01
.XXX = ± .005

MATERIAL:
SEE P/L
A044998-01
A046901-01

FINISH:

DRAWN BY	DIEU	DATE 3-8-89
CHECKED BY	A JACKSON	DATE 3-29-89
ENGR, ELECT	J MARGOLIN	DATE 3-29-89
PROJ ENGR	R MONCRIEF	DATE 3-29-89
MFG ENGR	D WRIGHTNOUR	DATE 3-30-89

ATARI

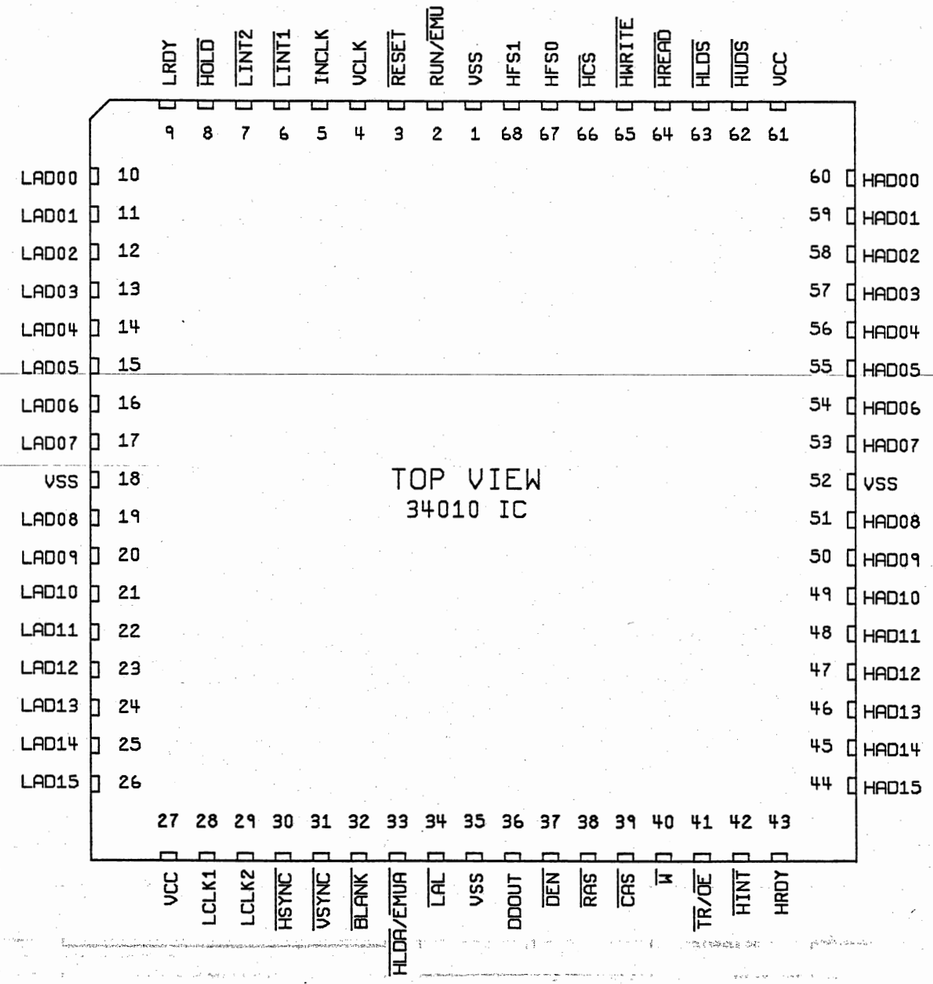
ATARI GAMES CORP.
675 SYCAMORE DRIVE
MILPITAS, CA 95035

TITLE
ASSEMBLY, SUB, MULTISYNC PCB

SIZE	DRAWING NO.	REV
D	A044998-01	F

SCALE NTS SHEET 1 OF 1

REVISIONS					
SYM	DESCRIPTION	DATE	INCORP	CHECK	APPROVED
A	PRODUCTION RELEASE	3-6 89	STAFF		JM RM
B	ECN 13481	5-24 89	STAFF	G.	gm
C	ECN 13482	5-24 89	STAFF	G.	gm
D	ECN 13517	6-14 89	GRP	AJ	JM
E	ECN 13817	4-5 90	JD	F.	JM
F	ECN 14093	11-26 90	LBF		gm



TOP VIEW
34010 IC

BOTTOM VIEW
34010 SOCKET

	61	63	65	67	1	3	5	7	9	
60	62	64	66	68	2	4	6	8	11	10
58	59								13	12
56	57								15	14
54	55								17	16
52	53								19	18
50	51								21	20
48	49								23	22
46	47								25	24
44	45	42	40	38	36	34	32	30	28	26
	43	41	39	37	35	33	31	29	27	

NEXT ASSY	FIRST USED ON

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
ANGLES ± 1°
.XX = ± .01
.XXX = ± .005

MATERIAL:
SEE PL
A044998-01
A046901-01

FINISH:

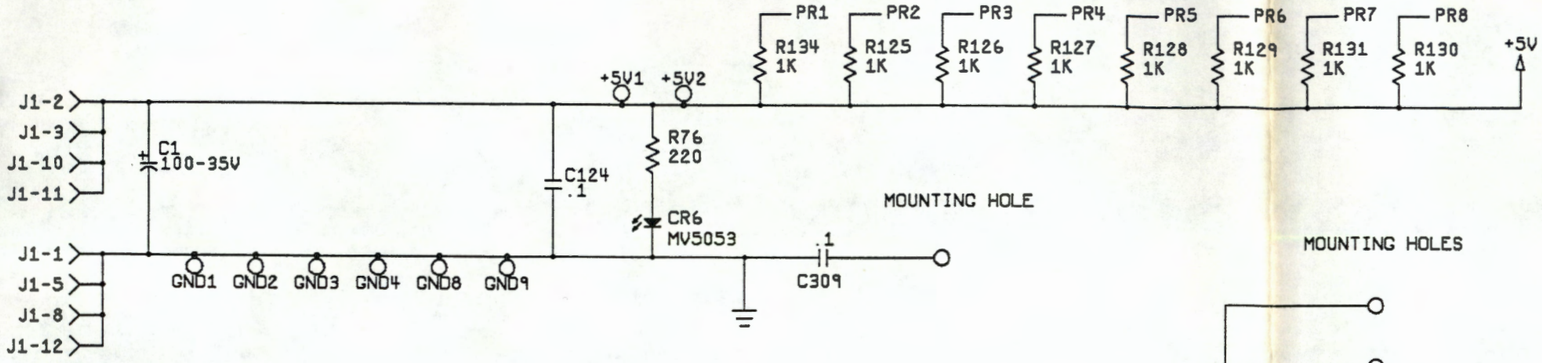
	DRAWN BY	DATE
	STAFF	
CHECKED BY	AJ	3-29-89
ENGR,ELECT	JM	3-29-89
PROJ ENGR	RM	3-29-89
MFG ENGR	DW	3-30-89

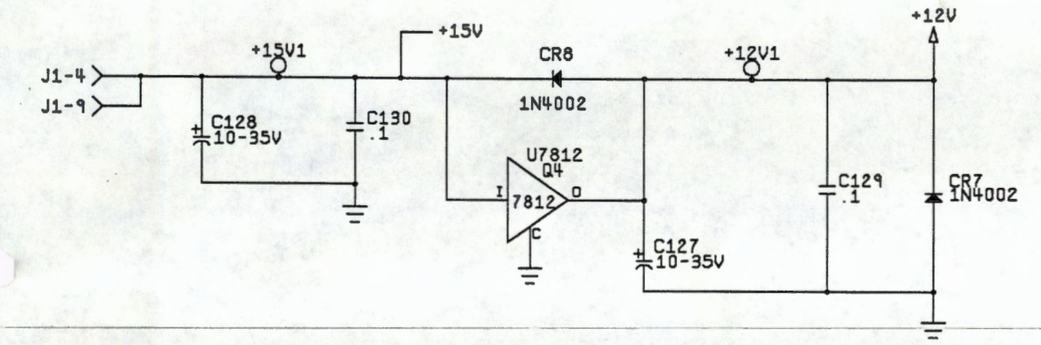
ATARI
ATARI GAMES CORP.
675 SYCAMORE DRIVE
MILPITAS, CA. 95035

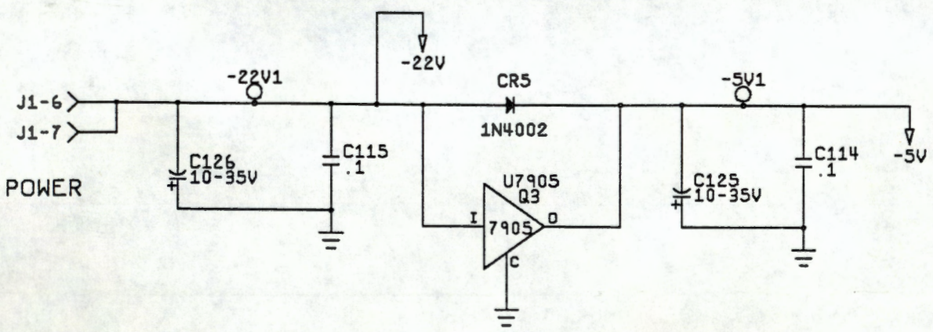
TITLE
SCHEMATIC
MULTISYNC PCB

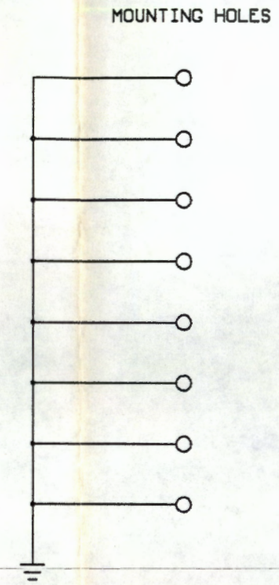
SIZE	DRAWING NO.	REV
D	044998-01	F

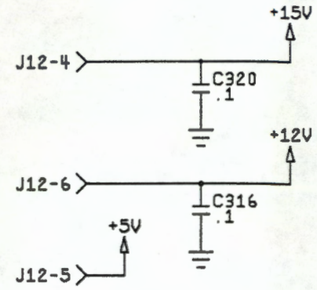
SCALE NONE SHEET 1 OF 17

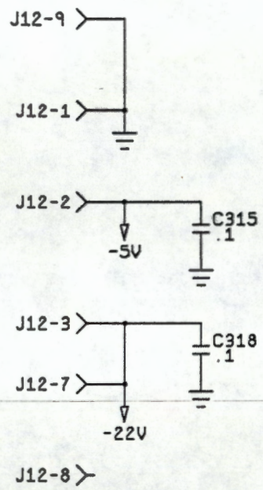






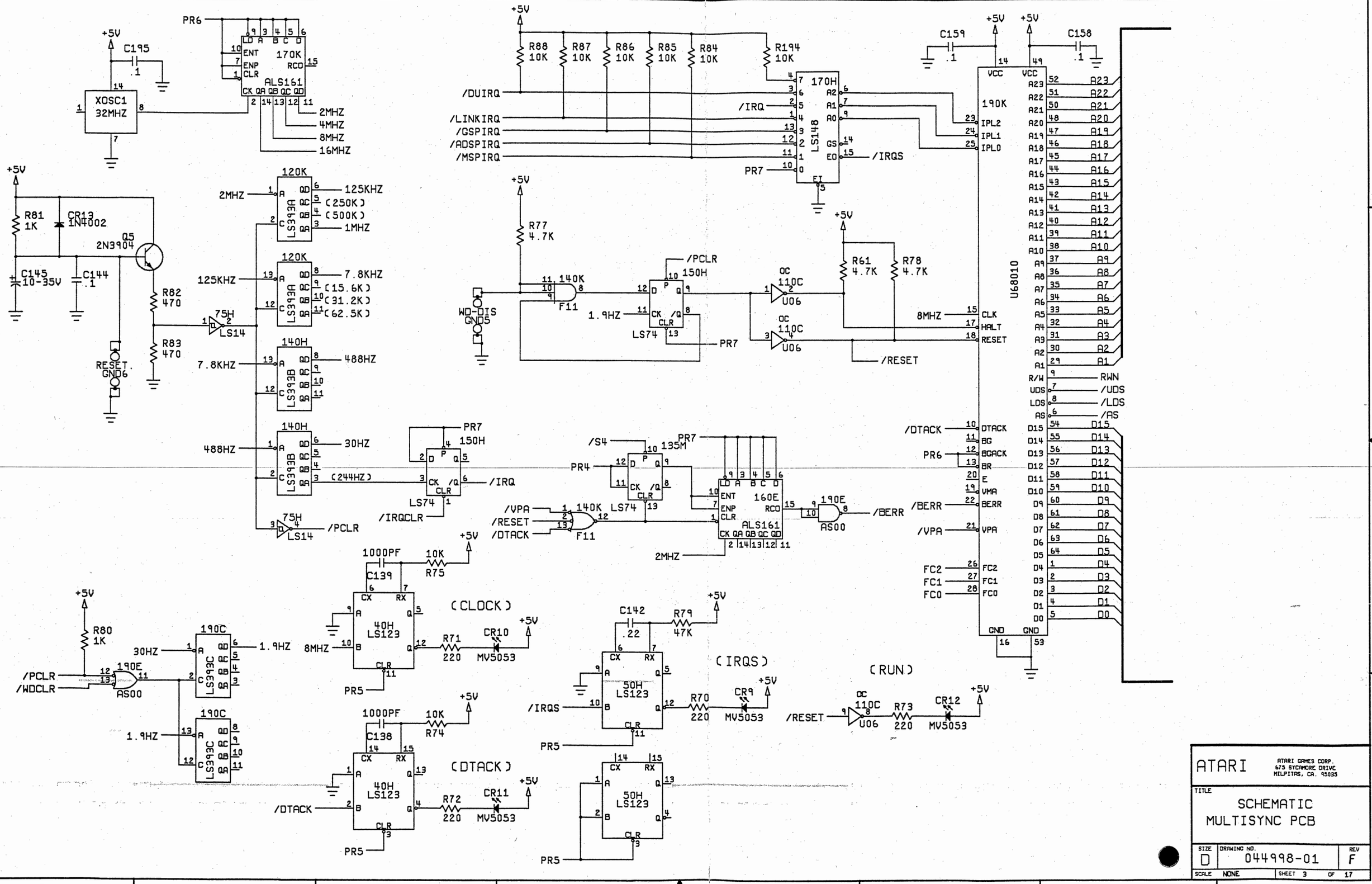






SOUND

ATARI	ATARI GAMES CORP. 675 SYCAMORE DRIVE MILPITAS, CA. 95035	
TITLE: SCHEMATIC MULTISYNC PCB		
SIZE: D	DRAWING NO.: 044998-01	REV: F
SCALE: NONE	SHEET 2 OF 17	

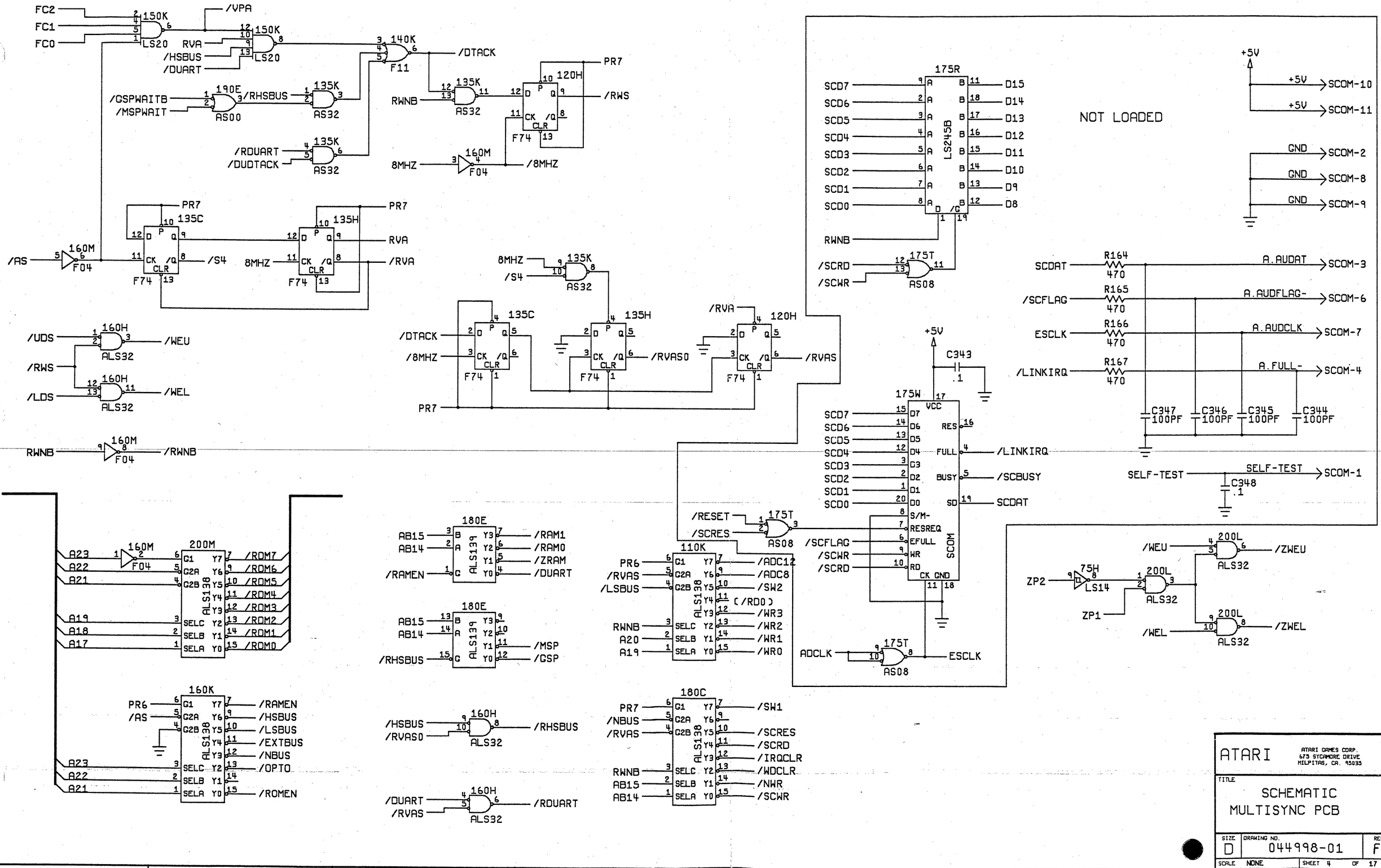


ATARI

ATARI GAMES CORP.
675 SYCAMORE DRIVE
MILPITAS, CA. 95035

TITLE
SCHEMATIC
MULTISYNC PCB

SIZE	DRAWING NO.	REV
D	044998-01	F
SCALE NONE	SHEET 3 OF 17	



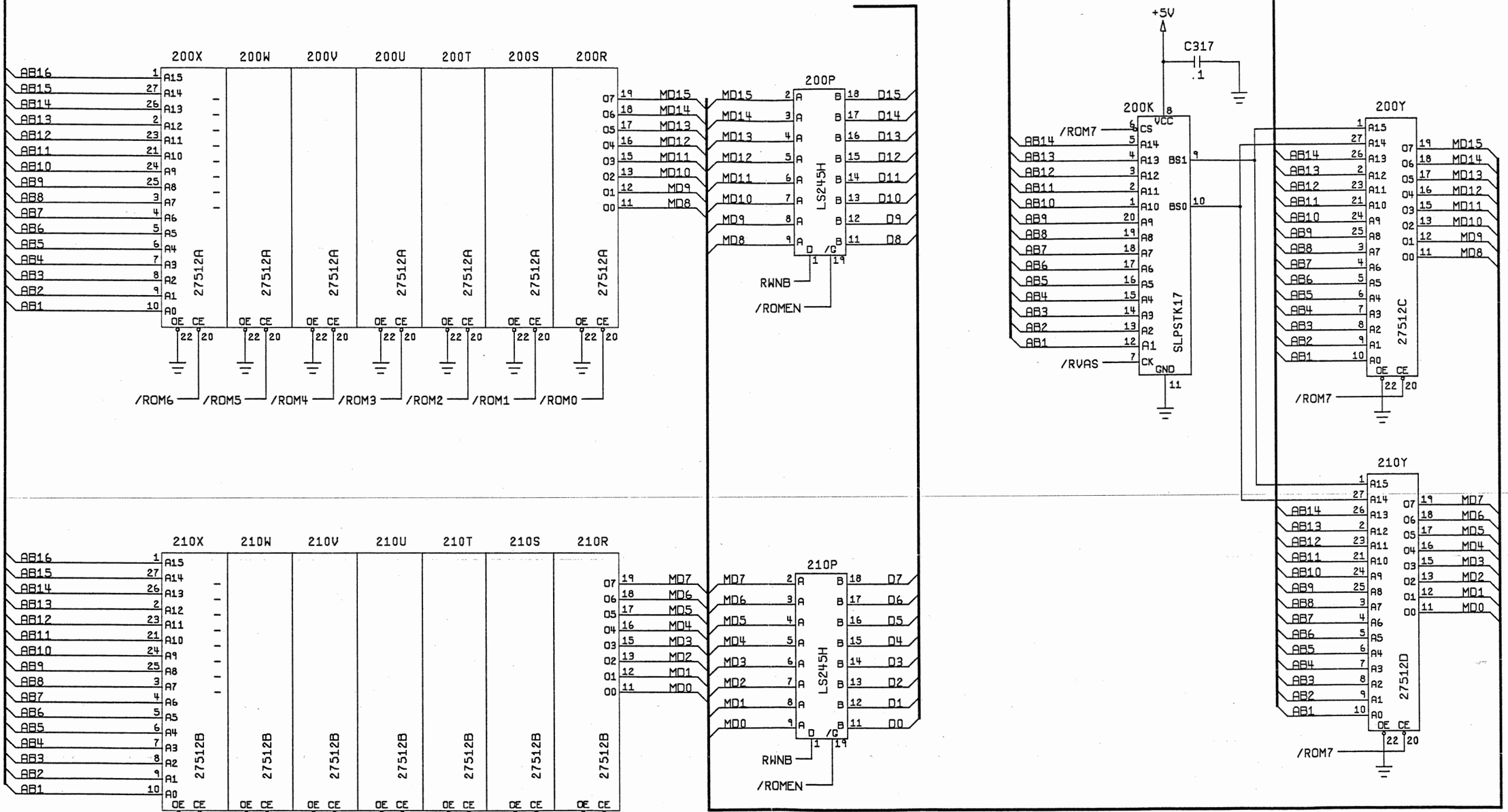
ATARI

ATARI GAMES CORP.
673 SYCAMORE DRIVE
MILPITAS, CA. 95035

TITLE
SCHEMATIC
MULTISYNC PCB

SIZE	DRAWING NO.	REV
D	044998-01	F

SCALE NONE SHEET 4 OF 17



ATARI

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675 SYCAMORE DRIVE
MILPITAS, CA. 95035

TITLE
SCHEMATIC
MULTISYNC PCB

SIZE	DRAWING NO.	REV
D	044998-01	F

SCALE NONE SHEET 5 OF 17

48T02-15

200E

200D

200C

8K8/150A

200F

LS245J

48Z02-15

210E

210D

210C

8K8/150B

210F

LS245J

200A

68681

XTAL1
3.6864
MHZ

210A

MC1488

SERIAL A

/CTSA

RXDA

MC1489AL

/RTSA

205B

4066B

SERIAL B

/CTSB

RXDB

/RTSB

IP2

IP3

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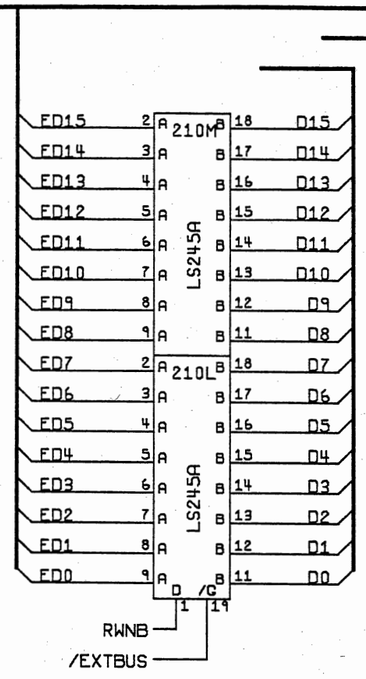
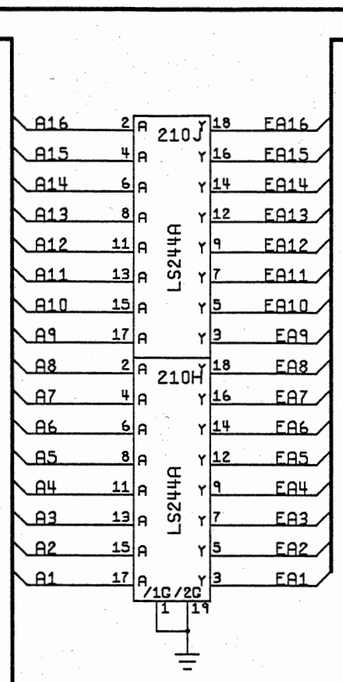
MILPITAS, CA. 95035

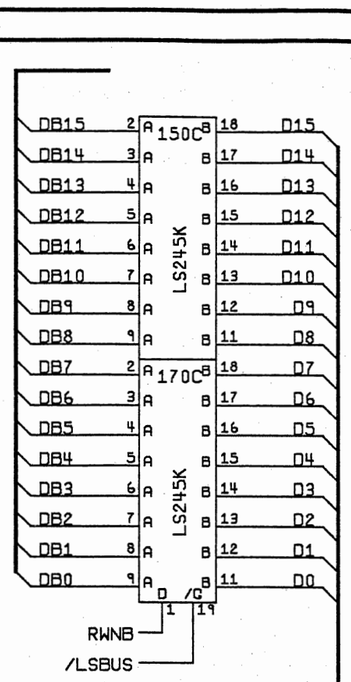
TITLE

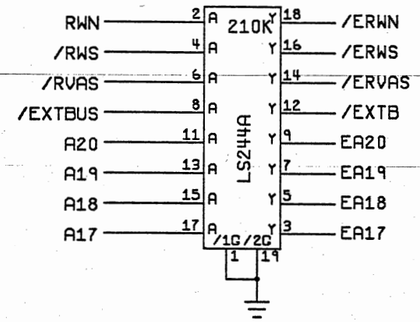
SCHEMATIC
MULTISYNC PCB

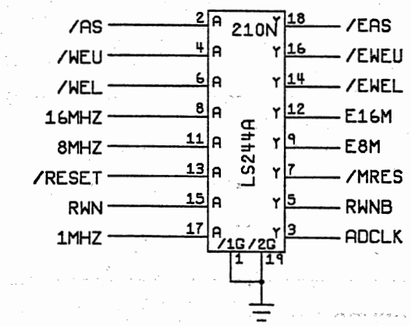
SIZE	DRAWING NO.	REV
D	044998-01	F
SCALE NONE	SHEET 6 OF 17	

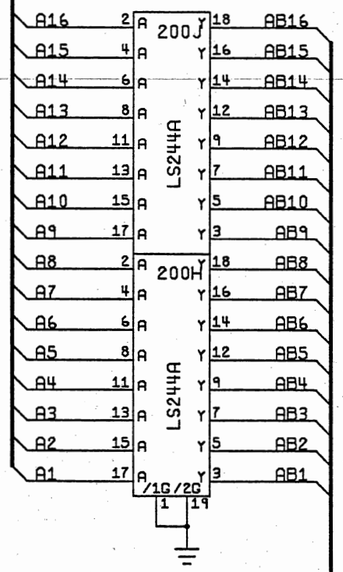


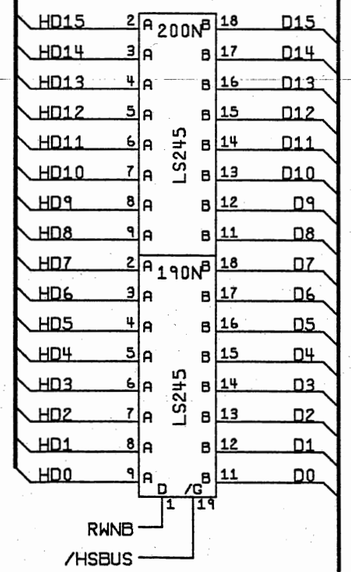


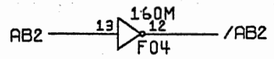




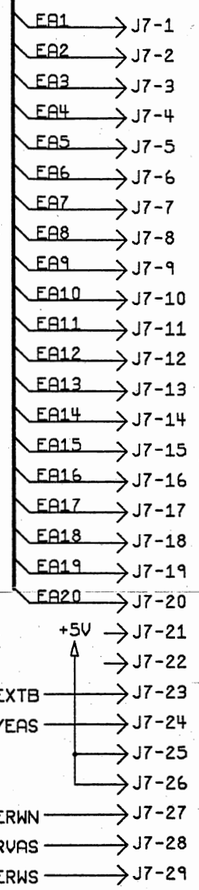


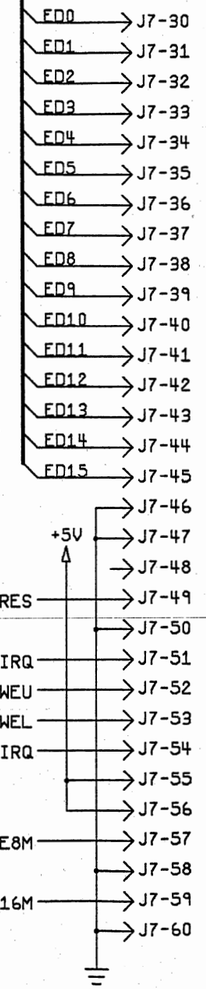






EXPANSION BUS



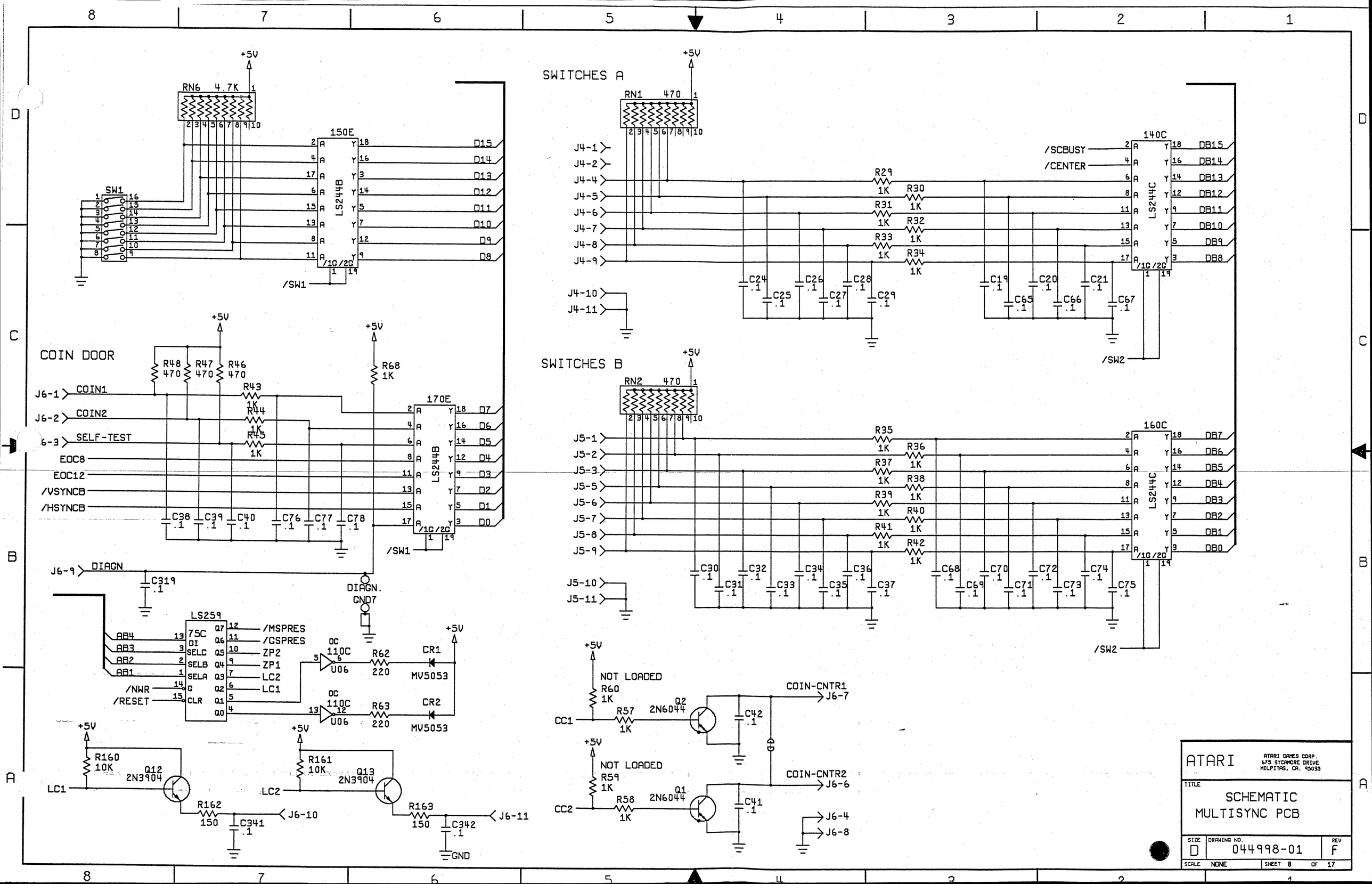


ATARI

ATARI GAMES CORP.
675 SYCAMORE DRIVE
MILPITAS, CA. 95035

TITLE
SCHEMATIC
MULTISYNC PCB

SIZE	DRAWING NO.	REV
D	044998-01	F
SCALE NONE	SHEET 7 OF 17	



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MILPITAS, CA. 95035

TITLE
SCHEMATIC
MULTISYNC PCB

SIZE	DRAWING NO.	REV
D	044998-01	F

SCALE NONE | SHEET 8 OF 17

SHIFTER

STEERING WHEEL

POTS C

NOT LOADED

LS259

85C

95C

60D

30D AD7582

60B

30B

45B

J8 = POTS A

J9 = POTS B

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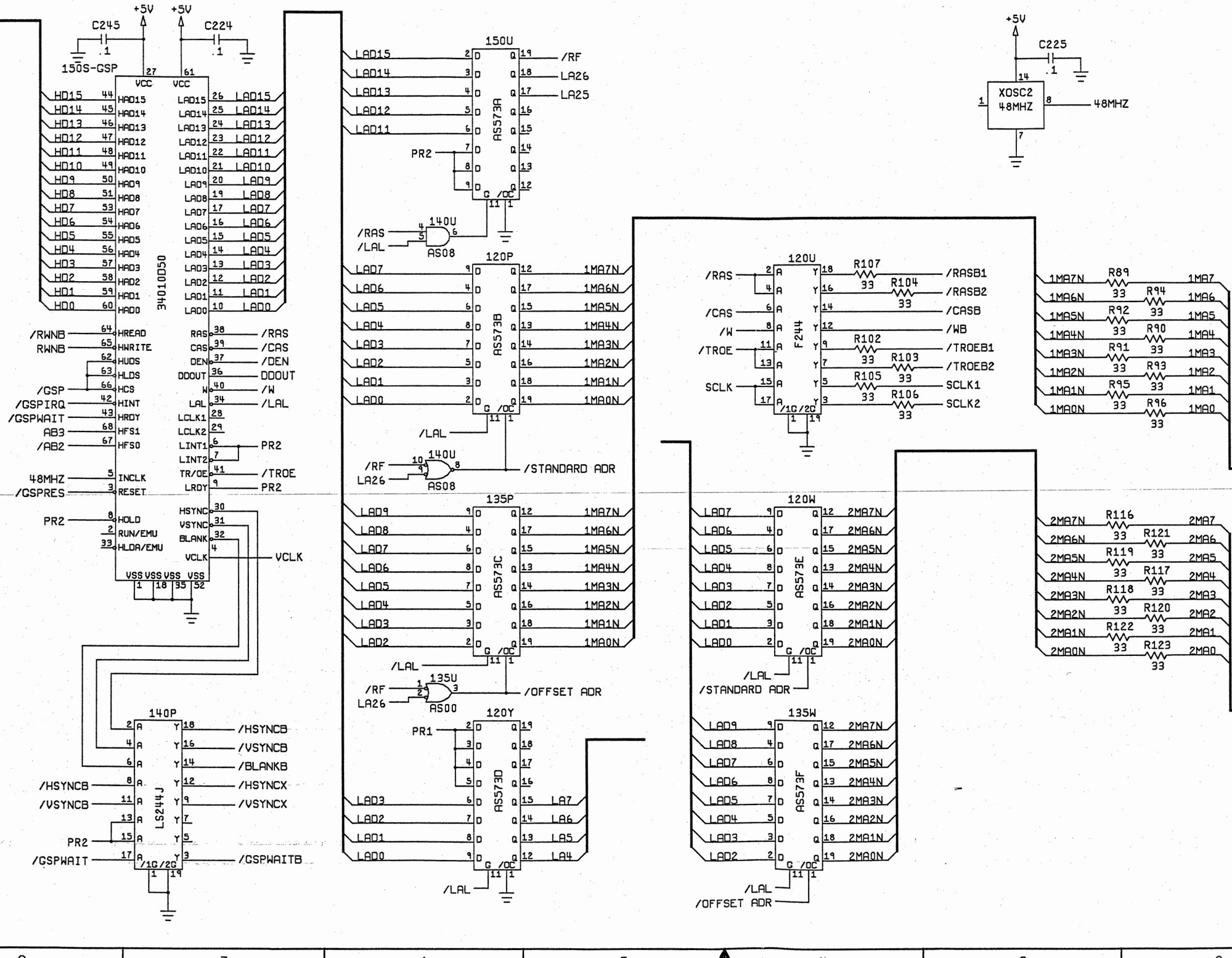
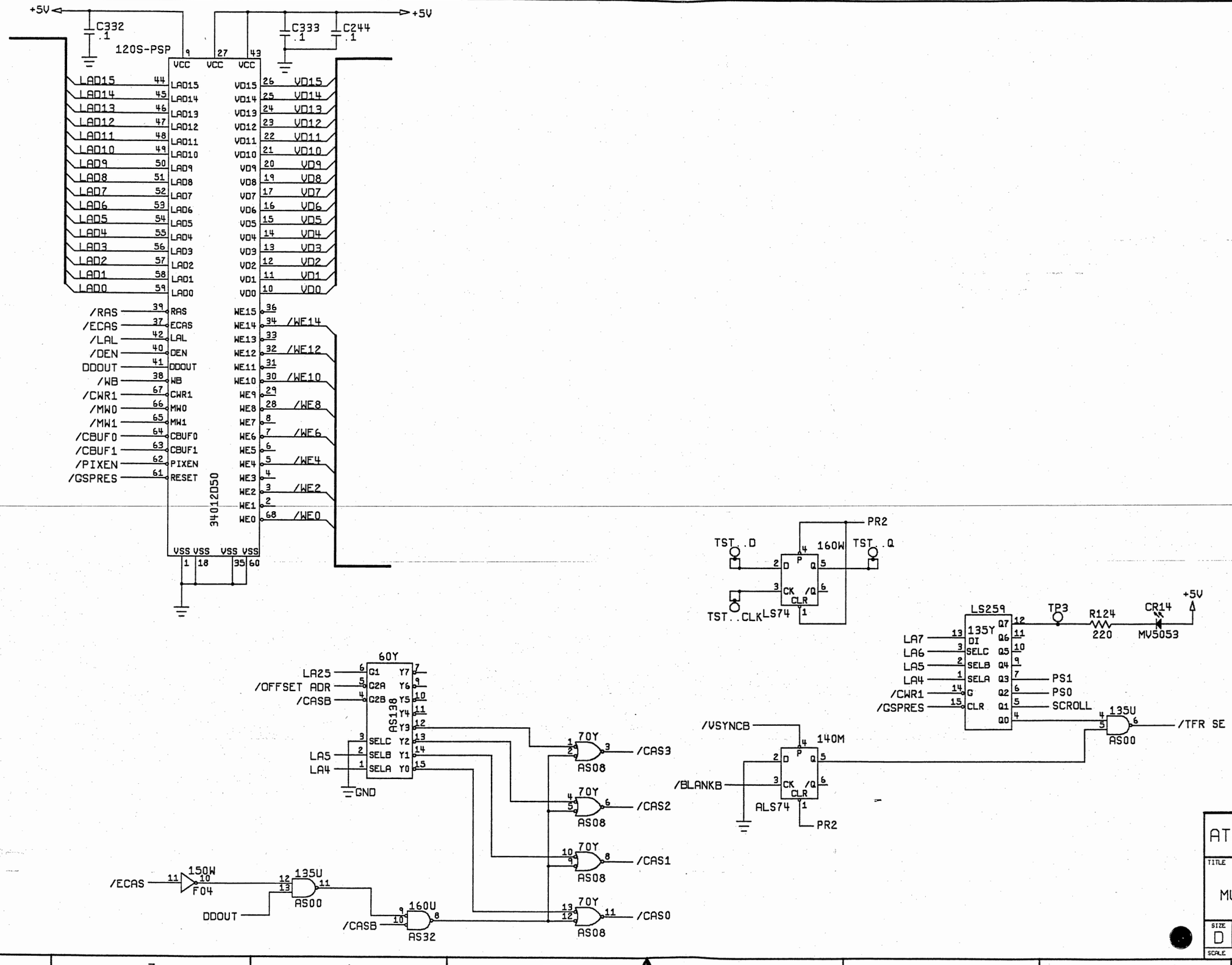
TITLE
SCHEMATIC
MULTISYNC PCB

SIZE D | DRAWING NO. 044998-01 | REV F

SCALE NONE | SHEET 9 OF 17

SCHSHT2 A


+5V
C245
.1
150S-GSP
VCC
HD15 HD14 HD13 HD12 HD11 HD10 HD9 HD8 HD7 HD6 HD5 HD4 HD3 HD2 HD1 HD0
HAD15 HAD14 HAD13 HAD12 HAD11 HAD10 HAD9 HAD8 HAD7 HAD6 HAD5 HAD4 HAD3 HAD2 HAD1 HAD0
34010D50
/RWNB RWNB /GSP /GSPIRQ /GSPWAIT AB3 /AB2 48MHZ /GSPRES PR2
HREAD HWRITE HUDS HLDS HCS HINT HRDY HFS1 HFS0 INCLK RESET HOLD RUN/EMU HLDA/EMU
VSS VSS VSS VSS
LAD15 LAD14 LAD13 LAD12 LAD11 LAD10 LAD9 LAD8 LAD7 LAD6 LAD5 LAD4 LAD3 LAD2 LAD1 LAD0
RAS CAS DEN DDOUT W LAL LCLK1 LCLK2 LINT1 LINT2 TR/OE LRDY HSYNC VSYNC BLANK VCLK
/RAS /CAS /DEN DDOUT /W /LAL PR2 /TROE PR2 VCLK
C224
.1
150U
AS573A
LAD15 LAD14 LAD13 LAD12 LAD11 PR2
/RF LA26 LA25
140U
AS08
/RAS /LAL
120P
AS573B
LAD7 LAD6 LAD5 LAD4 LAD3 LAD2 LAD1 LAD0
1MA7N 1MA6N 1MA5N 1MA4N 1MA3N 1MA2N 1MA1N 1MA0N
/LAL
140U
AS08
/RF LA26
/STANDARD ADR
135P
AS573C
LAD9 LAD8 LAD7 LAD6 LAD5 LAD4 LAD3 LAD2
1MA7N 1MA6N 1MA5N 1MA4N 1MA3N 1MA2N 1MA1N 1MA0N
/LAL
135U
AS00
/RF LA26
/OFFSET ADR
120Y
AS573D
PR1
LAD3 LAD2 LAD1 LAD0
LA7 LA6 LA5 LA4
/LAL
140P
LS244J
/HSYNCB /VSYNCB PR2 /GSPWAIT
/HSYNCB /VSYNCB /BLANKB /HSYNCX /VSYNCX /GSPWAITB
/1G /2G
+5V
C225
.1
XOSC2
48MHZ
48MHZ
120U
F244
/RAS /CAS /W /TROE SCLK
/RASB1 /RASB2 /CASB /WB /TROEB1 /TROEB2 SCLK1 SCLK2
R107 R104 R102 R103 R105 R106
33
1MA7N 1MA6N 1MA5N 1MA4N 1MA3N 1MA2N 1MA1N 1MA0N
R89 R94 R92 R90 R91 R93 R95 R96
1MA7 1MA6 1MA5 1MA4 1MA3 1MA2 1MA1 1MA0
120W
AS573E
LAD7 LAD6 LAD5 LAD4 LAD3 LAD2 LAD1 LAD0
2MA7N 2MA6N 2MA5N 2MA4N 2MA3N 2MA2N 2MA1N 2MA0N
/LAL
/STANDARD ADR
135W
AS573F
LAD9 LAD8 LAD7 LAD6 LAD5 LAD4 LAD3 LAD2
2MA7N 2MA6N 2MA5N 2MA4N 2MA3N 2MA2N 2MA1N 2MA0N
/LAL
/OFFSET ADR
2MA7N 2MA6N 2MA5N 2MA4N 2MA3N 2MA2N 2MA1N 2MA0N
R116 R121 R119 R117 R118 R120 R122 R123
33
2MA7 2MA6 2MA5 2MA4 2MA3 2MA2 2MA1 2MA0
ATARI
ATARI GAMES CORP.
675 SYCAMORE DRIVE
MILPITAS, CA. 95035
TITLE
SCHEMATIC
MULTISYNC PCB
SIZE D
DRAWING NO. 044998-01
REV F
SCALE NONE
SHEET 10 OF 17
SCHSHT2 A



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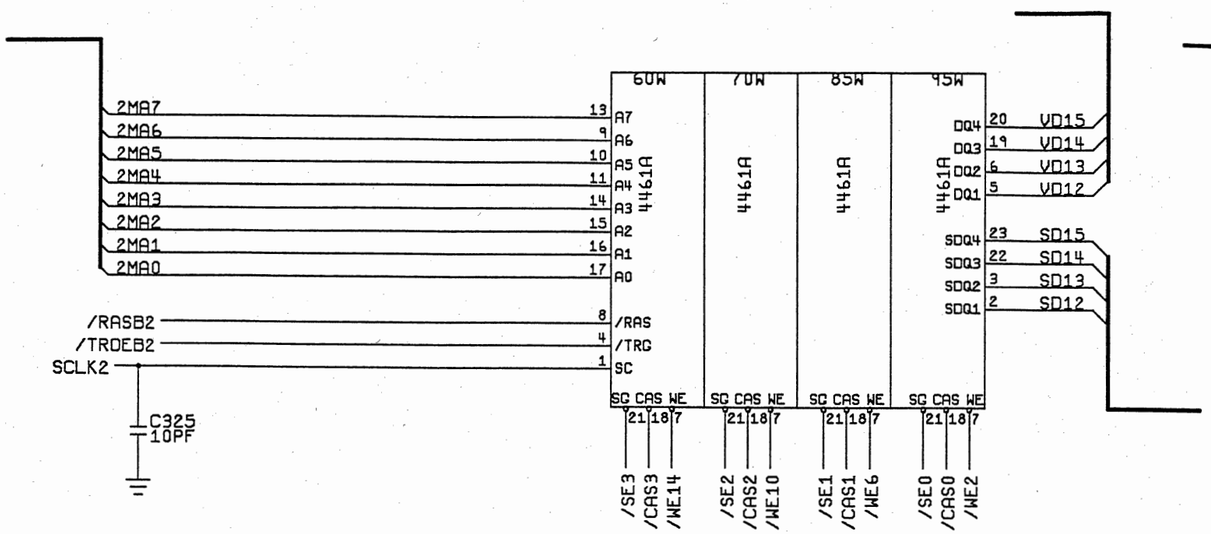
675 SYCAMORE DRIVE
MILPITAS, CA. 95035

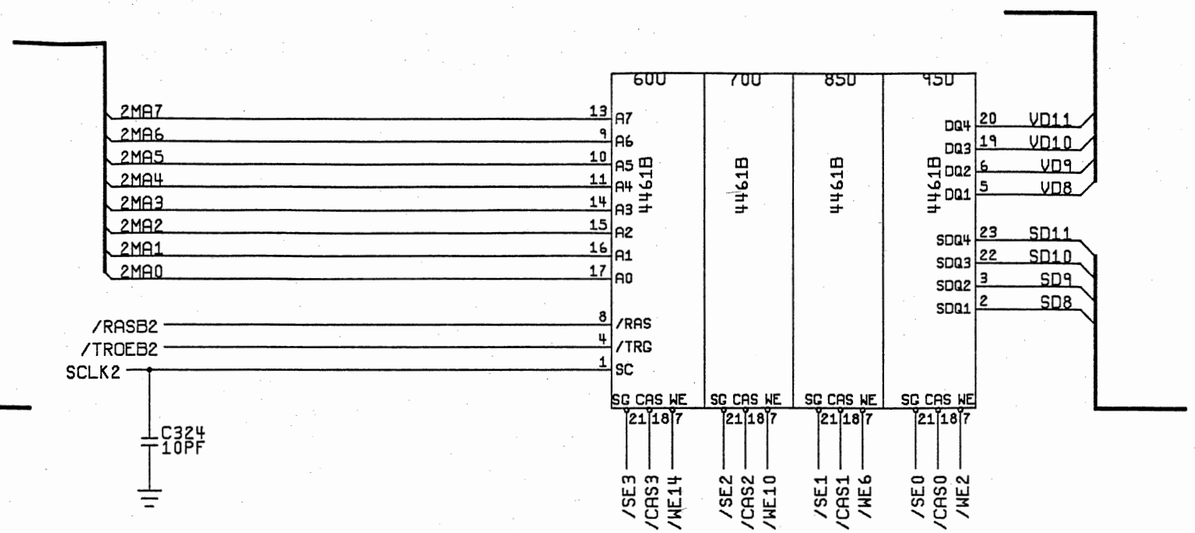
TITLE

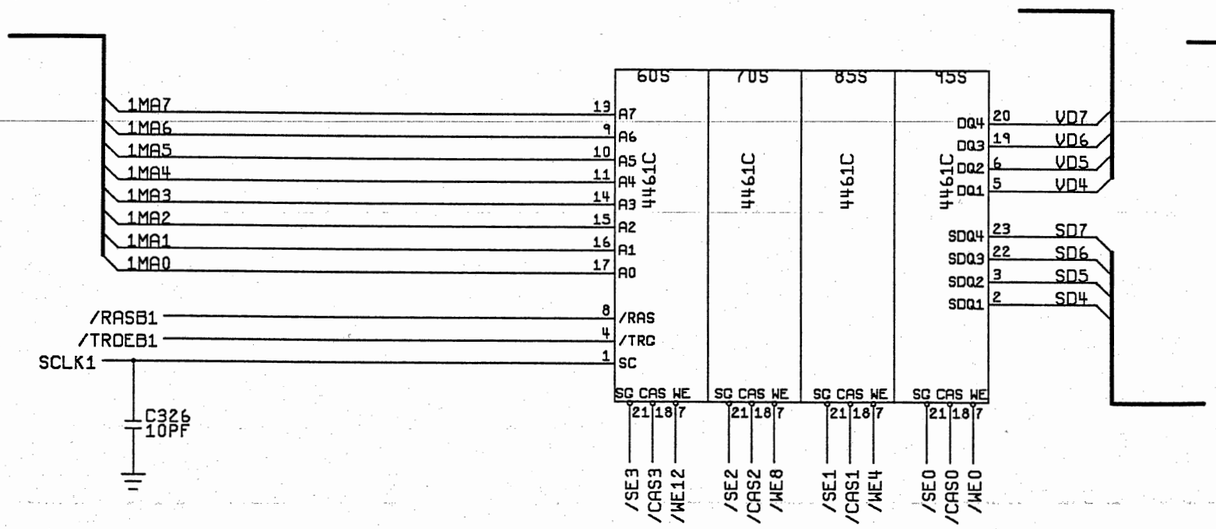
SCHEMATIC
MULTISYNC PCB

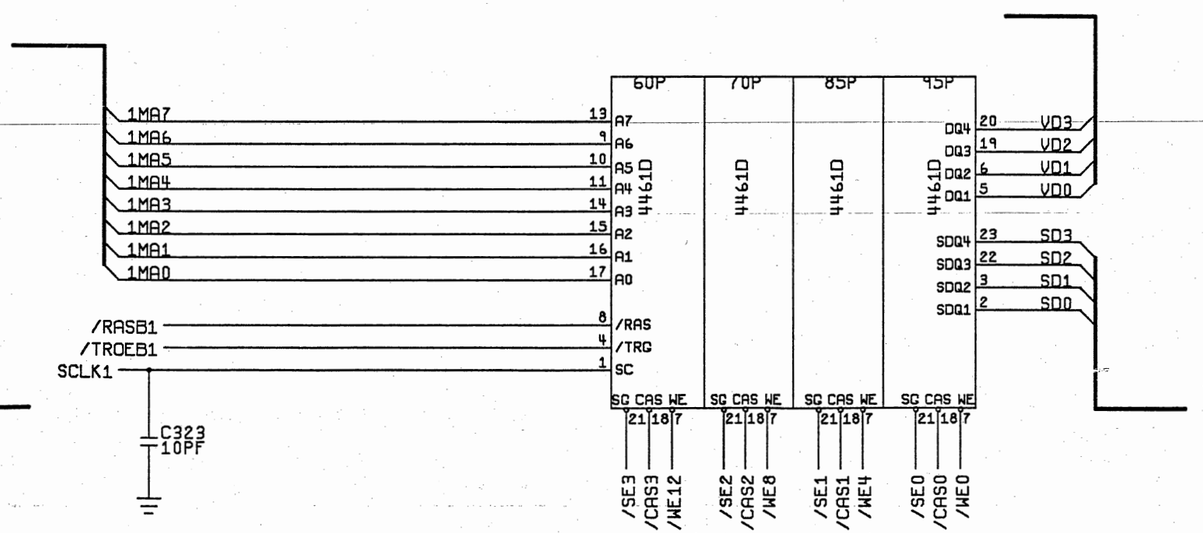
SIZE	DRAWING NO.	REV
D	044998-01	F
SCALE NONE	SHEET 11 OF 17	

SCHSHT2 A









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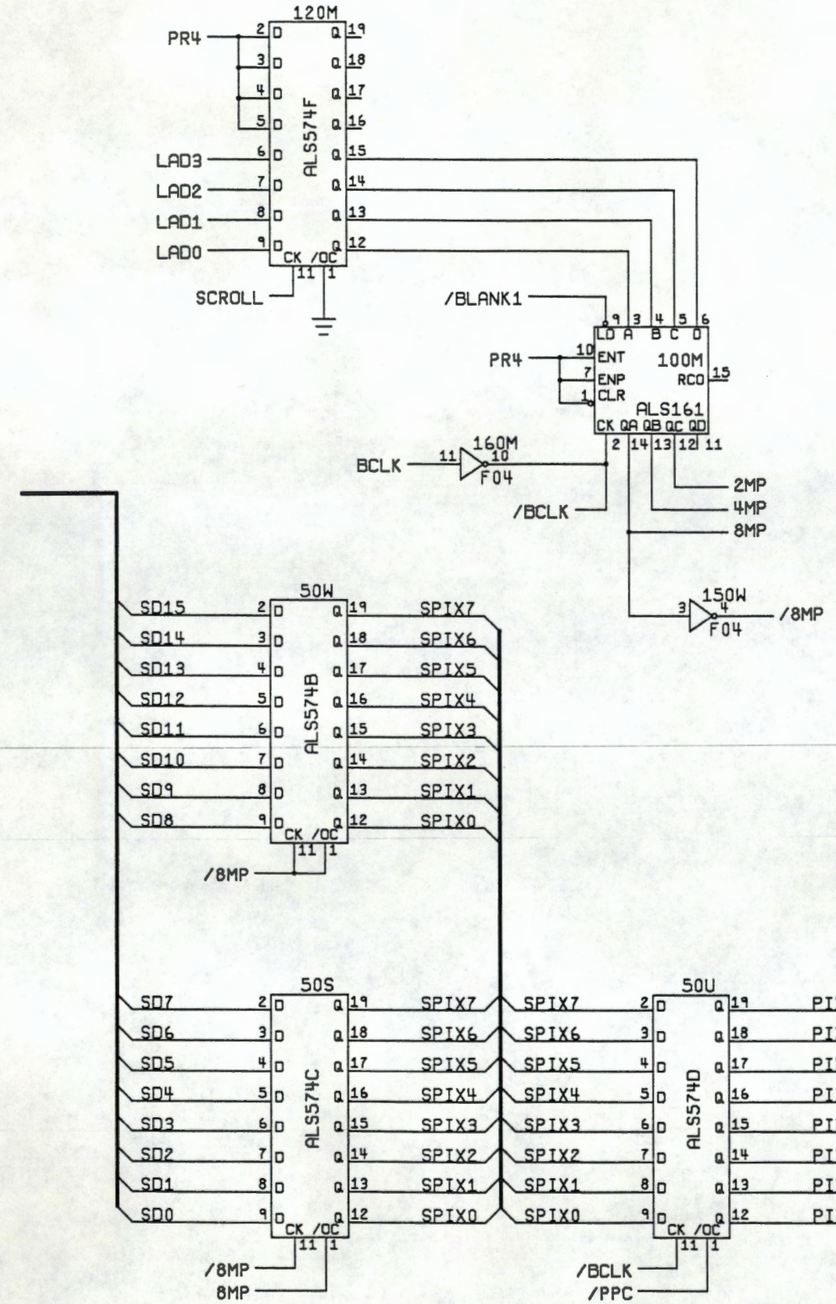
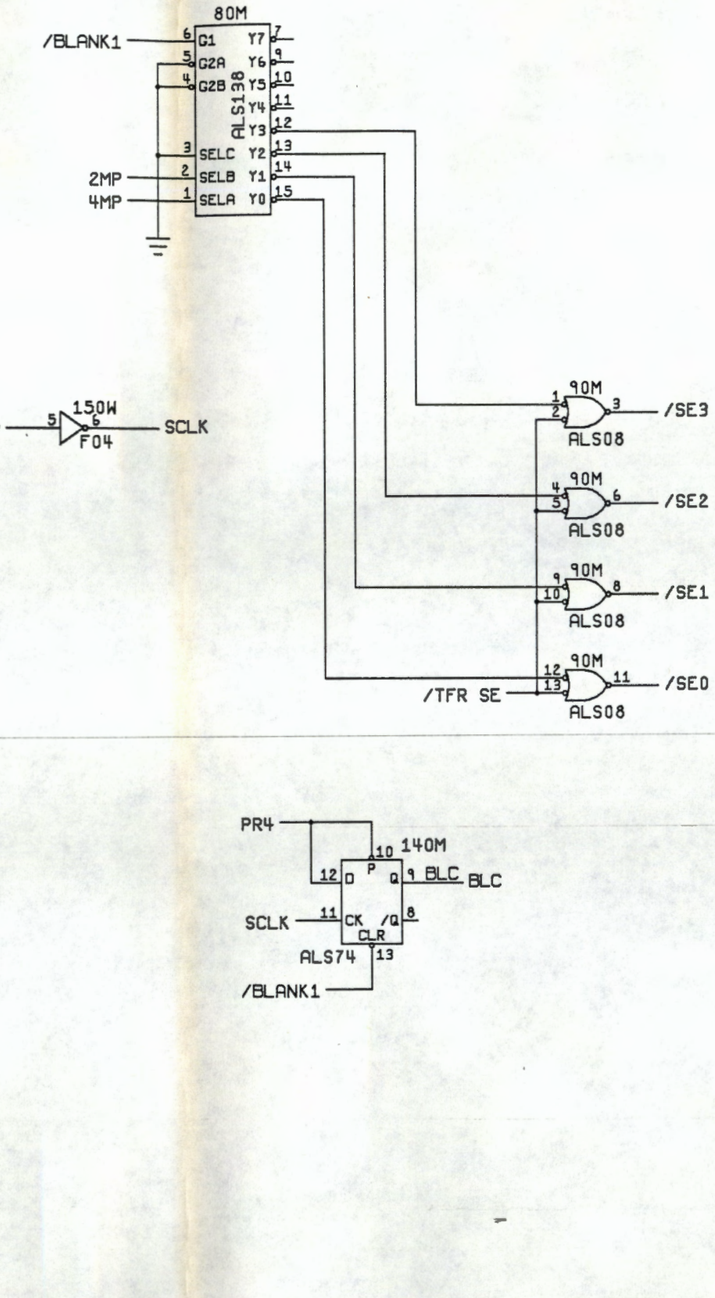
675 SYCAMORE DRIVE
MILPITAS, CA. 95035

TITLE
SCHEMATIC
MULTISYNC PCB

SIZE	DRAWING NO.	REV
D	044998-01	F
SCALE NONE	SHEET 12 OF 17	

SCHSHT2 A





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MILPITAS, CA. 95035

TITLE
SCHEMATIC
MULTISYNC PCB

SIZE	DRAWING NO.	REV
D	044998-01	F

SCALE NONE | SHEET 13 OF 17

SCHSHT2 A

LAD7 LAD6 LAD5 LAD4 LAD3 LAD2 LAD1 LAD0
50Y
AS573G
PIX7 PIX6 PIX5 PIX4 PIX3 PIX2 PIX1 PIX0
/LAL
/PIXEN
/CASB
150W F04
160U AS32
150W F04
/PPC

/MW1G /MW0G
PS1 PS0
PIX7 PIX6 PIX5 PIX4 PIX3 PIX2 PIX1 PIX0
40W 30W 40U 30U 40S 30S
2149045
BL4 BL5 BL6 BL7 BL0 BL1 BL2 BL3
GRN4 GRN5 GRN6 GRN7 GRN0 GRN1 GRN2 GRN3
RED4 RED5 RED6 RED7 RED0 RED1 RED2 RED3

LAD15 LAD14 LAD13 LAD12 LAD11 LAD10 LAD9 LAD8
30P
LS245F
RED7 RED6 RED5 RED4 RED3 RED2 RED1 RED0
LAD7 LAD6 LAD5 LAD4 LAD3 LAD2 LAD1 LAD0
40Y
LS245F
GRN7 GRN6 GRN5 GRN4 GRN3 GRN2 GRN1 GRN0
DDOUT
/CBUF0

LAD7 LAD6 LAD5 LAD4 LAD3 LAD2 LAD1 LAD0
30Y
LS245G
BL7 BL6 BL5 BL4 BL3 BL2 BL1 BL0
DDOUT
/CBUF1

/MW0 /WB /MW1
160U AS32
/MW0G /MW1G

+5V
R168 10K
R169 10K
R170 10K
R171 10K
SPEED

/LOAD
PR1
150Y F161
150W F04
/LOAD
C349 .1
XOSC4 32MHZ
QB
PR1
160W LS74
QB/2
QB/2 QB 4MHZ
VCLK.
VCLK

QB 16MHZ
BCLK.
BCLK

RED7 RED6 RED5 RED4 RED3 RED2 RED1 RED0
20S
AS823
/BCLK /BLANK4
RRV
C230 .1
RN3
R97 3.3K NOT LOADED
Q6 2N3906
Q7 2N3904
R101 100
R100 100
R99 100
RED.
RED
J10-6
C229 47PF

GRN7 GRN6 GRN5 GRN4 GRN3 GRN2 GRN1 GRN0
20U
AS823
/BCLK /BLANK4
GRV
C251 .1
RN4
R108 3.3K NOT LOADED
Q8 2N3906
Q9 2N3904
R111 100
R110 100
R109 100
GRN.
GREEN
J10-4
C250 47PF

BL7 BL6 BL5 BL4 BL3 BL2 BL1 BL0
20W
AS823
/BCLK /BLANK4
BRV
C275 .1
RN5
R112 3.3K NOT LOADED
Q10 2N3906
Q11 2N3904
R115 100
R114 100
R113 100
BLU.
BLUE
J10-2
C274 47PF

J10-1
J10-3
J10-5
J10-7
/CSYNC J10-9

VIDEO

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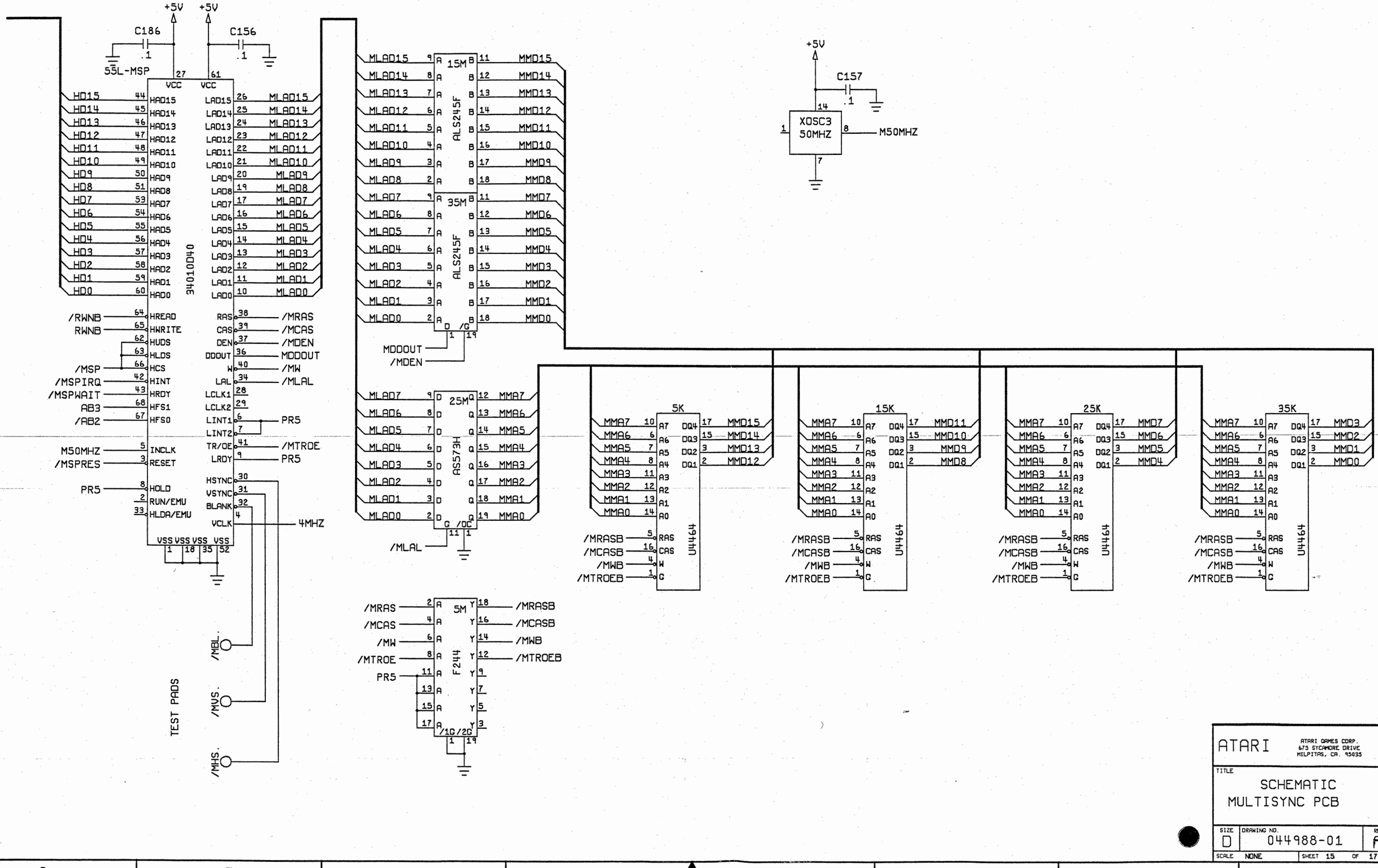
675 SYCAMORE DRIVE
MILPITAS, CA. 95035

TITLE
SCHEMATIC
MULTISYNC PCB

SIZE	DRAWING NO.	REV
D	044998-01	F
SCALE NONE	SHEET 14 OF 17	

SCHSHT2 A



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675 SYCAMORE DRIVE
MILPITAS, CA. 95035

TITLE
SCHEMATIC
MULTISYNC PCB

SIZE	DRAWING NO.	REV
D	044988-01	F

SCALE	SHEET	OF
NONE	15	17

SCHSHT2 A

+5V NOT LOADED
R179 10K
R180 10K
R181 10K
J13-1
J13-2
J13-3
195W HC14
185W LS14
Q0.
Q1.
C361 1000PF
C362 1000PF
C363 1000PF
R182 10K
R183 10K
R184 10K
PR9
175U
/CENTER
LS74
/CENRES
+12V
R186 82
+10V
CR21 1N4740A 10V,1W
C365 .1
C366 470/16V
R191 1K
C378 .001
R192 270K
J13-4
J13-5
J13-6
J13-7
J13-8
J13-9
J13-11
C364 .1
185U
LS374D
Q1.
Q0.
NEWQ1
NEWQ0
/DN
/UP
OLDQ1
OLDQ0
/CLKDN
/CLKUP
/8MHZ
R185 1K
SGB.IN
R187 330/1/2W
R188 1K
C367 .1
R189 2.2M
R190 10K
SG.SW
R197 1K
15B
AD711
CR22
MV5053
SGB.OUT
R193 1K
C368 10/20V/T
/CLKDN
/CLKUP
/OPTORES
185W LS14
185T LS193
CL LD CU CD
BOR CAR
C3.
C2.
C1.
C0.
195T LS193
C7.
C6.
C5.
C4.
PR9
195R
LS138
/RVAS
/OPTO
/OPTORD
RWNB
AB15
AB14
/CENRES
/OPTORES
185R
LS374E
C7.
C6.
C5.
C4.
C3.
C2.
C1.
C0.
D15
D14
D13
D12
D11
D10
D9
D8
/8MHZ
/OPTORD
195U
82S123
NEWQ1
NEWQ0
OLDQ1
OLDQ0
/DN
/UP

ATARI
ATARI GAMES CORP.
675 SYCAMORE DRIVE
MILPITAS, CA. 95035

TITLE
SCHEMATIC
MULTISYNC PCB

SIZE D | DRAWING NO. 044998-01 | REV F
SCALE NONE | SHEET 16 OF 17

SCHSHT2.A

PR2 135U AS00

PR8 190E AS00

PR7 200L ALS32

110C U06

PR5 75H LS14

75H LS14

PR2 140U AS08

PR4 135M LS74

PR2 175T AS08

+5V

C86 C87 C123 C94 C95 C96 C97 C98 C99 C100

C101 C102 C103 C104 C105 C131 C132 C133 C134 C135

C140 C141 C143 C146 C147 C148 C149 C150 C151 C164

C165 C166 C167 C168 C169 C170 C171 C172 C173 C174

C175 C176 C177 C182 C183 C184 C185 C187 C188 C189

C352 C351 C350 C193 C194 C208 C209 C210 C211 C212

C196 C197 C198 C199 C200 C201 C202 C221 C222

C223 C231 C232 C233 C234 C213 C214 C215 C216 C217

C218 C219 C220 C243 C252 C253 C254 C255 C235

C236 C237 C238 C264 C265 C266

C267 C268 C269 C276 C277 C278 C279 C256 C257 C258

C259 C280 C281 C282 C283 C284

C289 C290 C291 C292 C293 C298

C299 C106 C116 C136

C152 C154 C160 C162 C178 C180 C204 C206 C226 C246

C369 C370 C371 C372 C373 C374 C375 C376 C377

+5V

C248 C270 C272 C285 C287 C306 C308 C117 C137 C153

C155 C161 C163 C179 C181 C205 C207 C227 C247 C249

C271 C273 C286 C288 C307

+5V VCC SPARE1 DIP16 GND

+5V VCC SPARE2 DIP16 GND

+5V VCC SPARE3 DIP16 GND

+5V VCC SPARE4 DIP16 GND

+5V SPARE16 VCC DIP20 GND

+5V SPARE17 VCC DIP20 GND

+5V SPARE18 VCC DIP20 GND

+5V SPARE7 VCC DIP20 GND

+5V VCC SPARE12 DIP16 GND

+5V VCC SPARE13 DIP16 GND

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SIZE	DRAWING NO.	REV
D	044998-01	F
SCALE NONE	SHEET 17 OF 17	

SCHSHT2 A